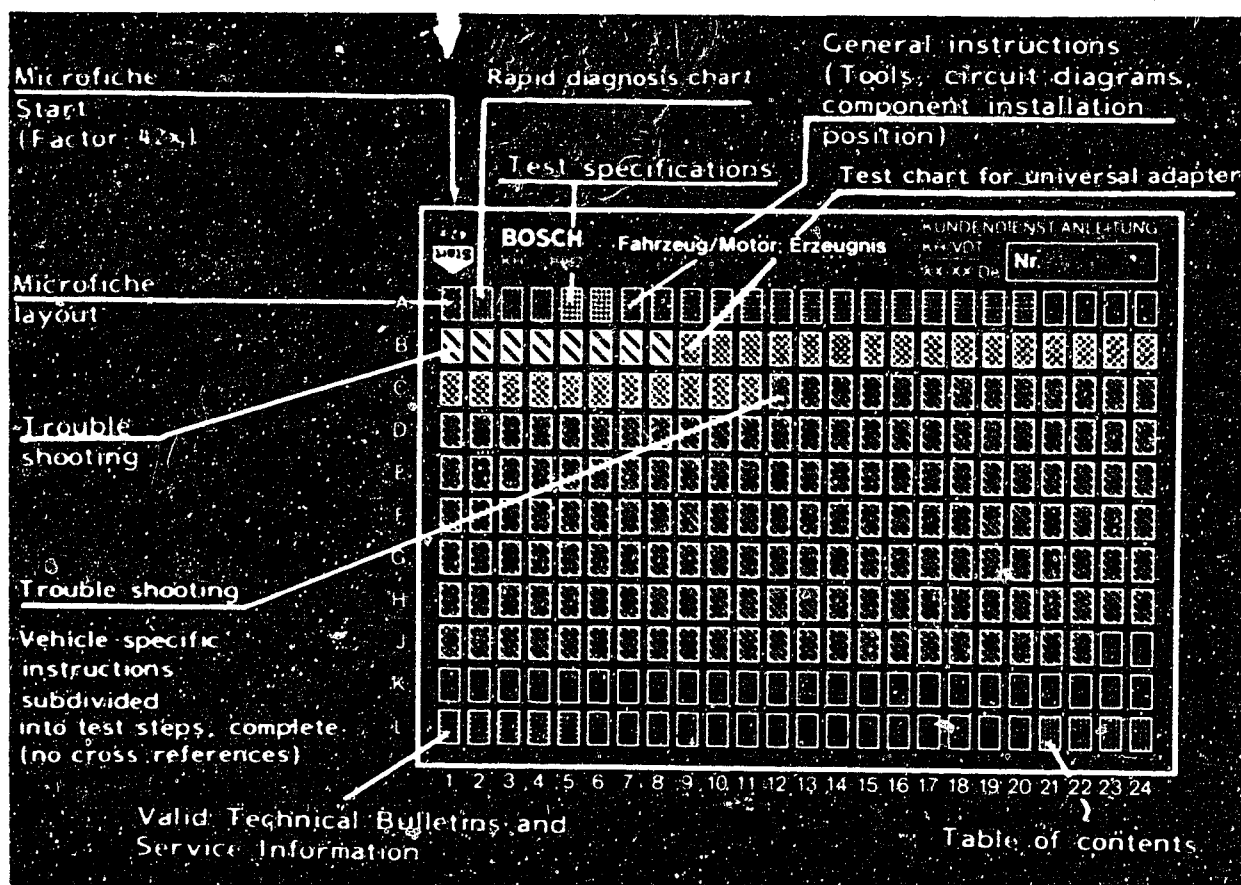


Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

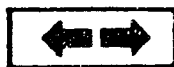
E 16	Product/assembly/test step	
	Vehicle/engine	

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-related passages identified by a vertical bar.

5. References to relevant test steps in test specifications; coordinate e.g. C6

C 6

A1

Trouble-shooting program



Rapid diagnosis chart for L-Jetronic universal adapter

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system using the L-Jetronic universal adapter.

The rapid diagnosis chart contains the following information:

- Switch positions on universal adapter
- Sequence of test steps
- Notes on how to operate the universal adapter or other components
- Readings on the multimeter
- References to coordinates of the relevant detailed testing and trouble-shooting program.

If detailed information and instructions are necessary, always proceed according to the trouble-shooting program starting on Coordinate B 1/B 2.



Rapid test chart for universal test adapter

Test step	Switch position		Remarks	Test specifications (reading)	For trouble-shooting see Coordinates
	V	Ω			
1	5	-	Shift gear to neutral. Operate starting motor. Measure voltage pulses with motortester.	Ignition pulses on motortester	B 10
2	6	-	Shift gear to neutral. Operate starting motor. Measure voltage.	8 ... 15 V	B 12
3	7	-	Shift gear to neutral. Operate starting motor. Measure voltage.	8 ... 15 V	B 14
4	↓	11	Measure resistance.	100...200 Ω	B 16
5	↓	12	Deflect air-flow sensor flap. Measure resistance.	60...1000 Ω	B 19
6	↓	13	Measure resistance.	30 Ω ..30k Ω (depends on temperature)	B 21
7	↓	14	Measure resistance.	0 10 Ω	B 23
8	↓	15	Measure resistance.	0 10 Ω	C 1
9	↓	16	Accelerator in rest position. Measure resistance.	0 10 Ω	C 3
10	↓	17	Accelerator fully depressed (full-load position). Measure resistance.	0 10 Ω	C 5
11	↓	18	Measure resistance.	+20°C: 8,20...10,90 Ω +80°C: 8,70...11,70 Ω	C 7
12	↓	19	Measure resistance.	+20°C: 8,20...10,90 Ω +80°C: 8,70...11,70 Ω	C 9

A3

Rapid test chart for univ. test adapter
BMW 5, 6 and 7 series



A4

Rapid test chart for univ. test adapter
BMW 5, 6 and 7 series



Test specification

B7

Idle speed 2.5 / 2.8 l engine
Manually-shifted transmission and
automatic transmission:

800...900 min⁻¹

Exhaust-gas setting
CO concentration with engine at
normal operating temperature:

less than 1.5 % by
Vol. CO

Fuel pressure:

2.8 ... 3.2 bar

Fuel pump delivery
for 2.5 l engine:
for 2.8 l engine:

min. 850 cm³/30s
min. 875 cm³/30s

Solenoid-operated injection valve

Electrical internal resistance
at 20°C:

15.0 ... 17.5 Ω

Auxiliary-air device

B5

Electrical internal resistance:

40 ... 75 Ω

Temperature sensor II (water)

B7

Electrical internal resistance
at ambient temperature
(+15°C...30°C):
at operating temperature
(approx. +80°C):

1,3...3,6 kΩ

250...390 Ω

See equipment and Autodata microfiches for settings for
ignition, valve clearance and other engine data.

A5

Test specifications

BMW 5, 6 and 7 series



Thermo-time switch

B7

Electrical internal resistance:

	Between term. G and ground	Between term. W and ground	Between term. G and W
At ambient temperature (below 30°C)	25...40Ω	0 Ω	25...40Ω
At operating temperature (above 40°C)	50...80 Ω	100..160Ω	50...80Ω

Air-flow sensor

B5

Resistance between

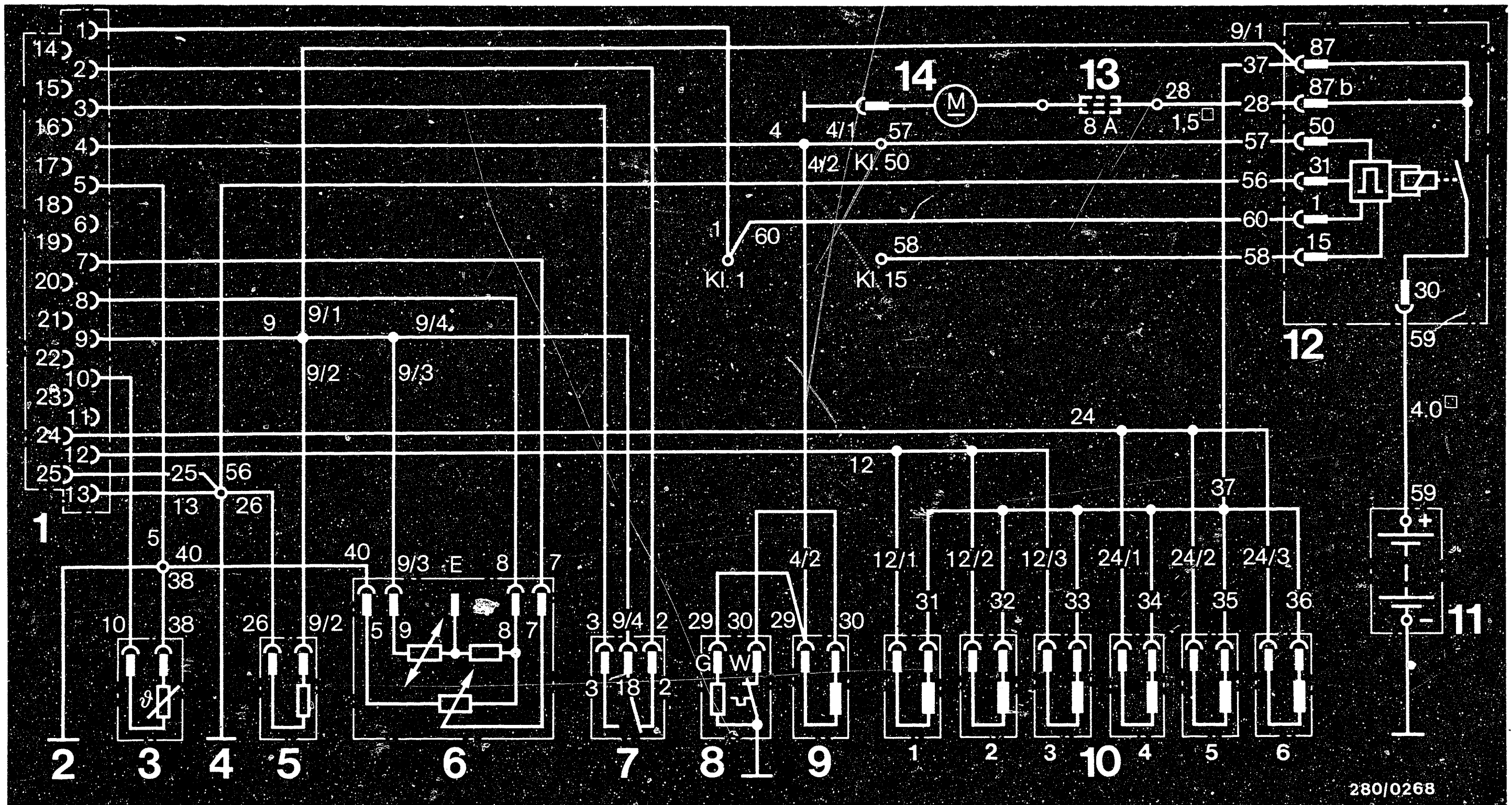
Term. 8 and term. 6:	340 ... 450Ω
Term. 7 and term. 6:	60 ... 1000Ω
Term. 8 and term. 9:	160 ... 300Ω
Term. 9 and term. 6:	500 ... 760Ω

See equipment and Autodata microfiches for settings for ignition, valve clearance and other engine data.

A6

Test specifications
BMW 5, 6 and 7 series





Electrical terminal diagram of LE-Jetronic

- | | | | |
|----------------------------------|---------------------------|-----------------------|-------------------------|
| 1 = Multiple plug | 5 = Auxiliary-air device | 9 = Start valve | 13 = Fuel pump fuse |
| 2 = Electronics ground terminal | 6 = Air-flow sensor | 10 = Injection valves | 14 = Electric fuel pump |
| 3 = Temperature sensor (engine) | 7 = Throttle-valve switch | 11 = Battery | |
| 4 = Output stage ground terminal | 8 = Thermo-time switch | 12 = Control relay | |

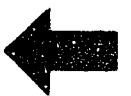
A7

Electrical terminal diagram
BMW 5, 6 and 7 series

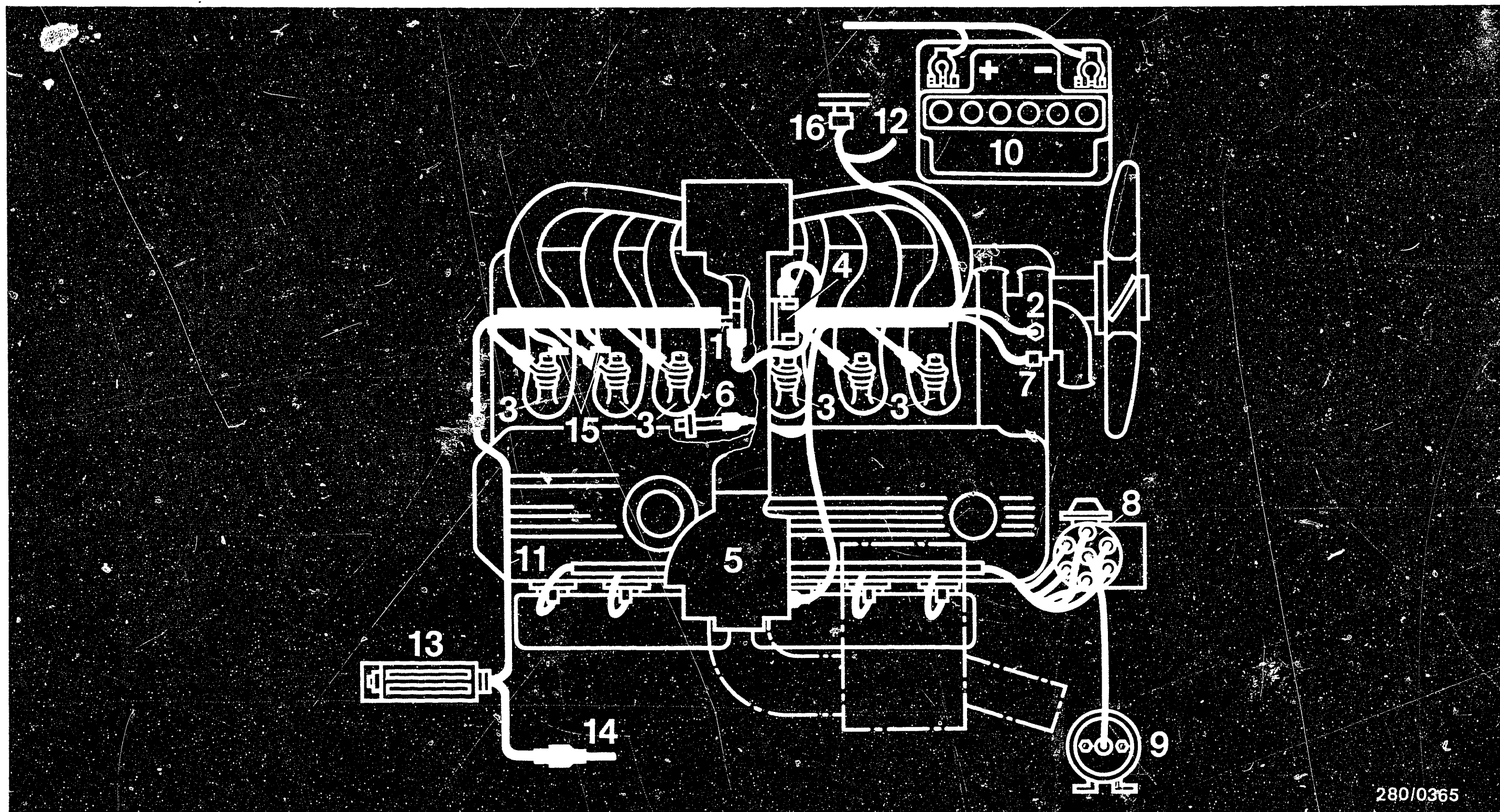


A8

Electrical terminal diagram
BMW 5, 6 and 7 series



280/0268



280/0365

Electrical wiring diagram of LE-Jetronic and arrangement of individual components

- | | | | |
|---------------------------|---------------------------|------------------------------|--------------------------------|
| 1 = Start valve | 5 = Air-flow sensor | 9 = Ignition coil | 13 = Control unit |
| 2 = Thermo-time switch | 6 = Auxiliary-air device | 10 = Battery | 14 = Plug-in connector term. 1 |
| 3 = Injection valves | 7 = Temperature sensor II | 11 = Jetronic wiring harness | 15 = Ground terminals |
| 4 = Throttle-valve switch | 8 = Ignition distributor | 12 = Vehicle wiring harness | 16 = Control relay |

A9

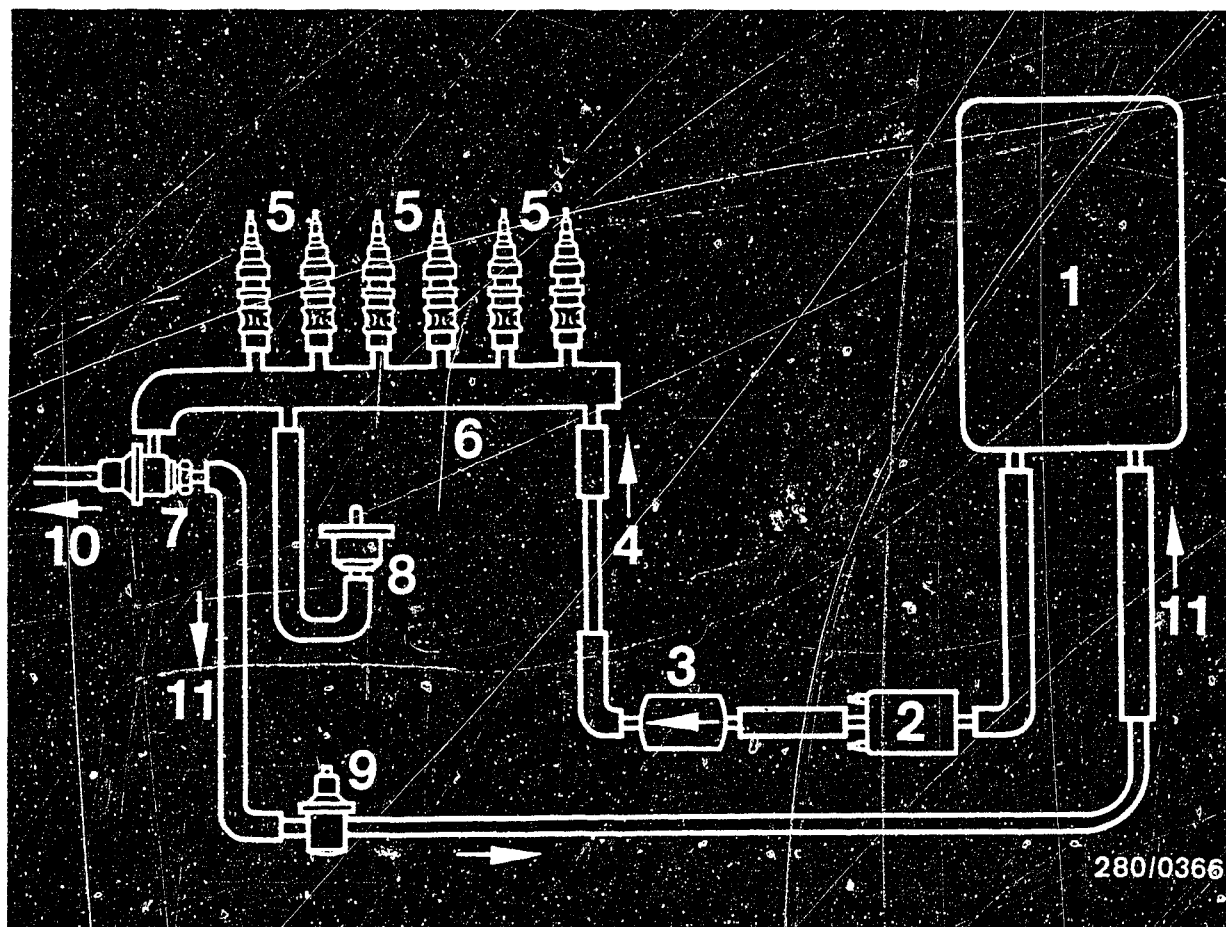
Electrical wiring diagram
BMW 5, 6 and 7 series



A10

Electrical wiring diagram
BMW 5, 6 and 7 series





280/0366

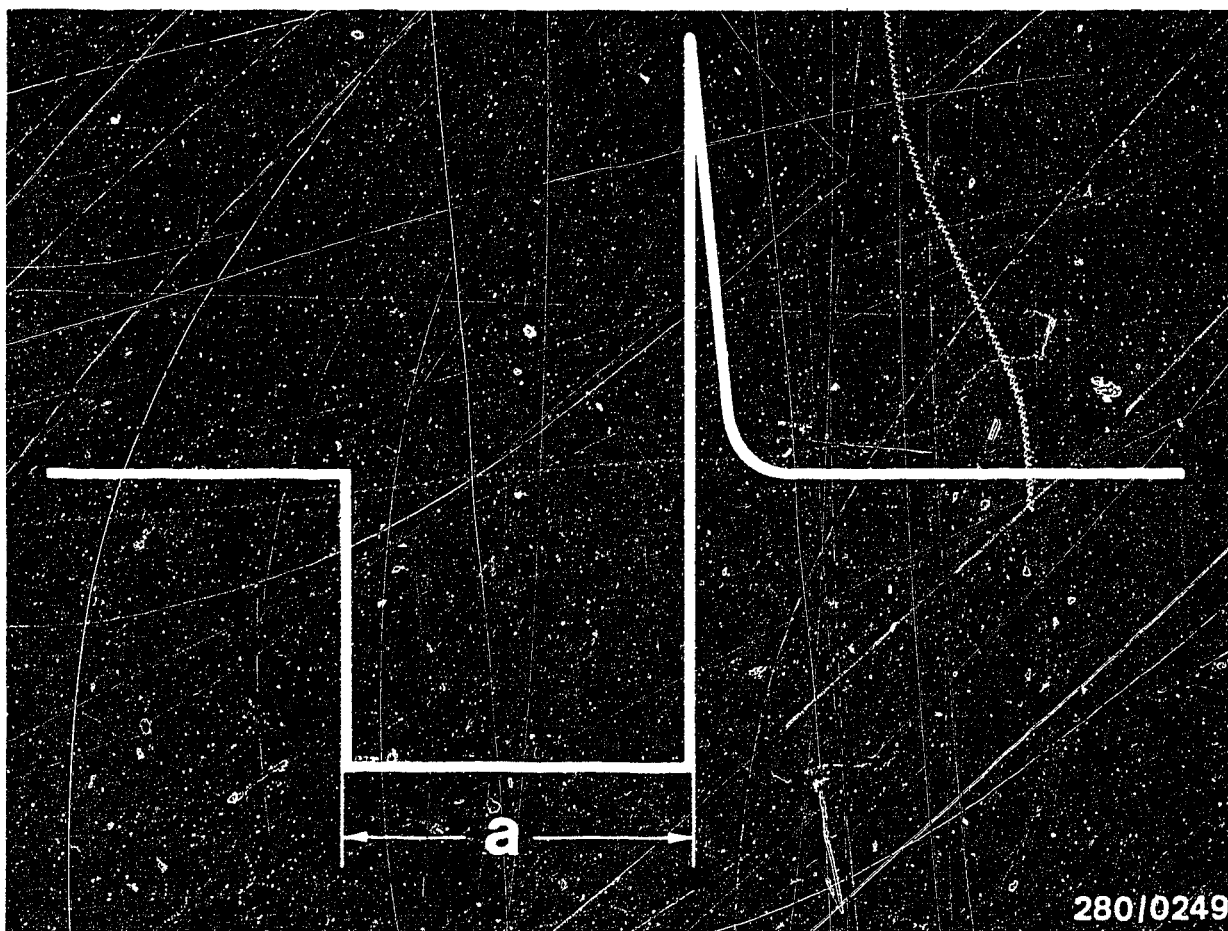
Diagram of fuel lines

- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel filter
- 4 = Fuel delivery line
- 5 = Solenoid-operated injection valves
- 6 = Fuel-distribution pipe
- 7 = Pressure regulator
- 8 = Start valve
- 9 = Fuel-line-pressure damper
- 10 = Connection to intake manifold
- 11 = Fuel return line

Test equipment and tools

Universal test adapter	ETT 018.01	0 684 101 801
Adapter lead		1 684 463 123
Motortester	e.g. MOT 002.00	0 684 000 200
Exhaust-gas analyser	e.g. ETT 008.00	0 684 100 800
	ETT 008.04	0 684 100 804
	ETT 008.05	0 684 100 805
Pressure gauge	Quality class 1.0 = 6 bar, 0.1 bar graduations	1 687 231 154
Three-way line		KDLE P-100/13
Test lead		1 684 463 093
Parts set		1 287 010 704
Pressure tester		KDJE-P 100
or		
Pressure tester (no longer available)		KDEP 1034
Electrics tester	e.g. ETE 014.00	0 684 101 400
or multimeter	e.g. Philips PM 2517 X	
	e.g. Miselco Master 50K	
	e.g. Chinaglia Cortina	
Solenoid-operated injection valve	<u>yellow plug</u> <u>part</u>	0 280 150 203
Tool set for fitting and removing the idle CO anti- tamper device on the air-flow sensor (e.g. No. 13 1090 from Cartool Co., Hans Schubert KG, Unterer Grasweg 88 D-8070 Ingolstadt		





a = Length of regulation (dependent on the engine load)

Test lead

Using the test lead, the injection pulses at the injection valves can be tested with an ignition oscilloscope with the engine running.

The illustration shows the injection pulse of a switched output stage, measured at the solenoid-operated injection valve.

Caution

Connect only one terminal of the test lead to the special input on the motortester. When the correct test terminal is connected, the above-shown voltage curve will be visible on the ignition oscilloscope.



Instructions on use of universal test adapter with adapter lead for LE-Jetronic

General:

The universal test adapter is plugged onto the vehicle wiring harness with the adapter lead.

Caution!

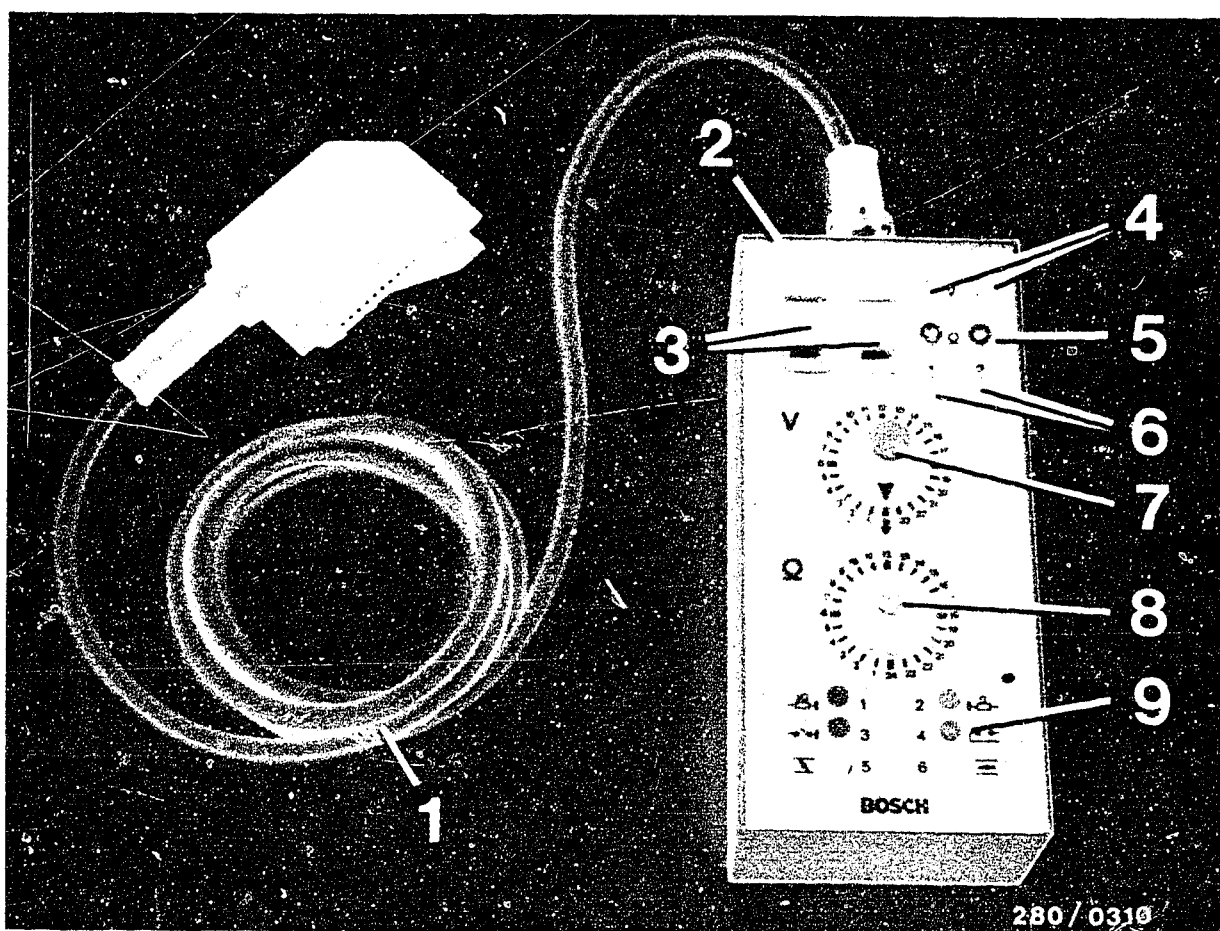
Connect and disconnect the universal test adapter only with the ignition switched off!

Testing:

For testing, connect a multimeter with R_i min. 20 k Ω /V to the universal test adapter.

In addition, the signal from term. 1 of the ignition coil can be measured with a motortester via the special input.

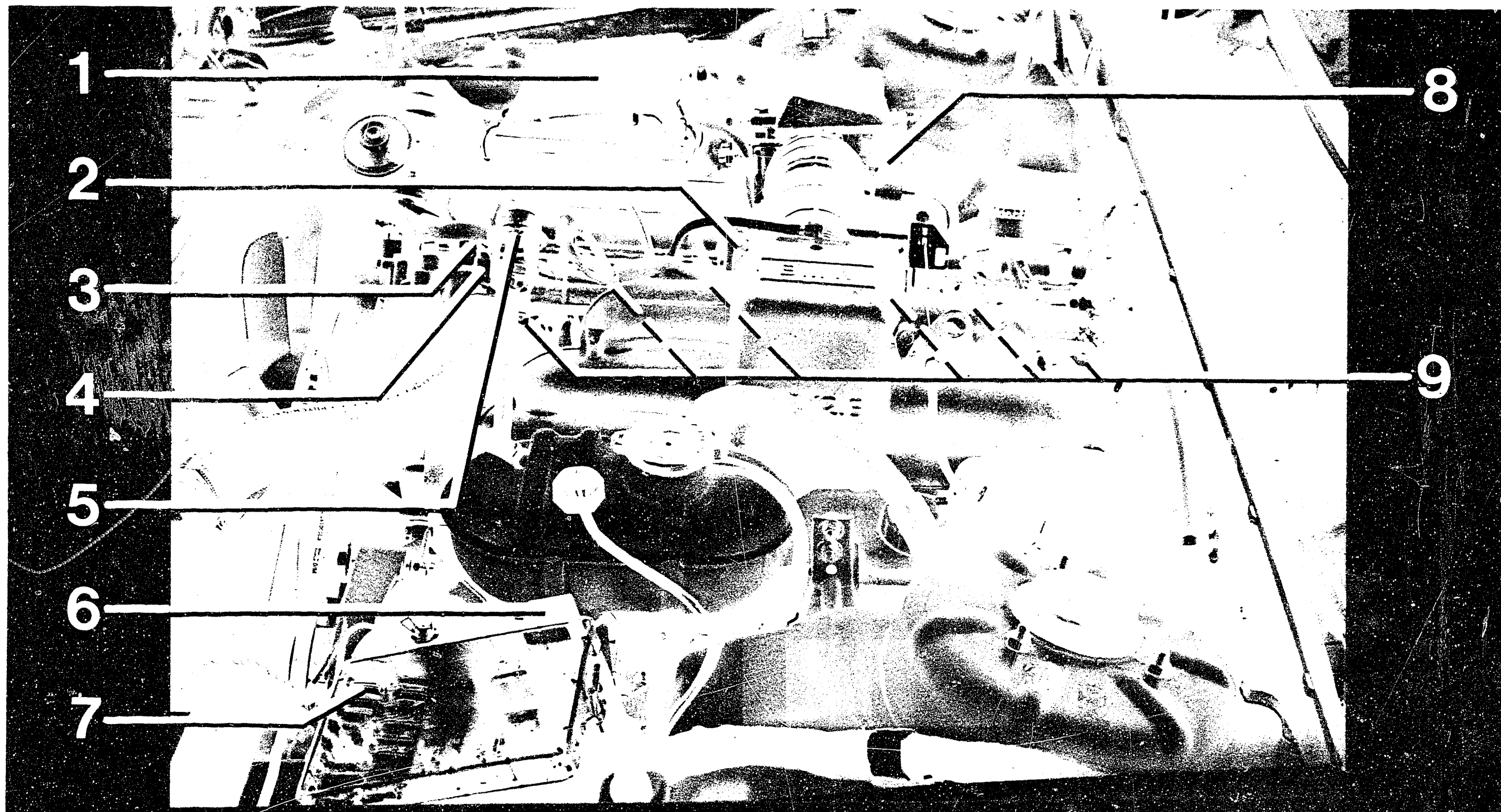




Universal test adapter with adapter lead for LE-Jetronic

- 1 = Adapter lead (Part No. 1 684 463 123)
- 2 = Universal test adapter (Part No.: 0 684 101 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (for voltage measurement)
- 5 = Test sockets (for resistance measurement)
- 6 = Test sockets (not yet occupied)
- 7 = Program switch "volt"
- 8 = Program switch "ohm"
- 9 = Button panel (not occupied for 2nd generation L-Jetronic)





Installation position of components

- 1 = Air filter
- 2 = Throttle-valve switch
- 3 = Temperature sensor II (white plug)

- 4 = Thermo-time switch
- 5 = Pressure regulator
- 6 = Control relay

- 7 = Pump fuse
- 8 = Air-flow sensor
- 9 = Solenoid-operated injection valves

A16

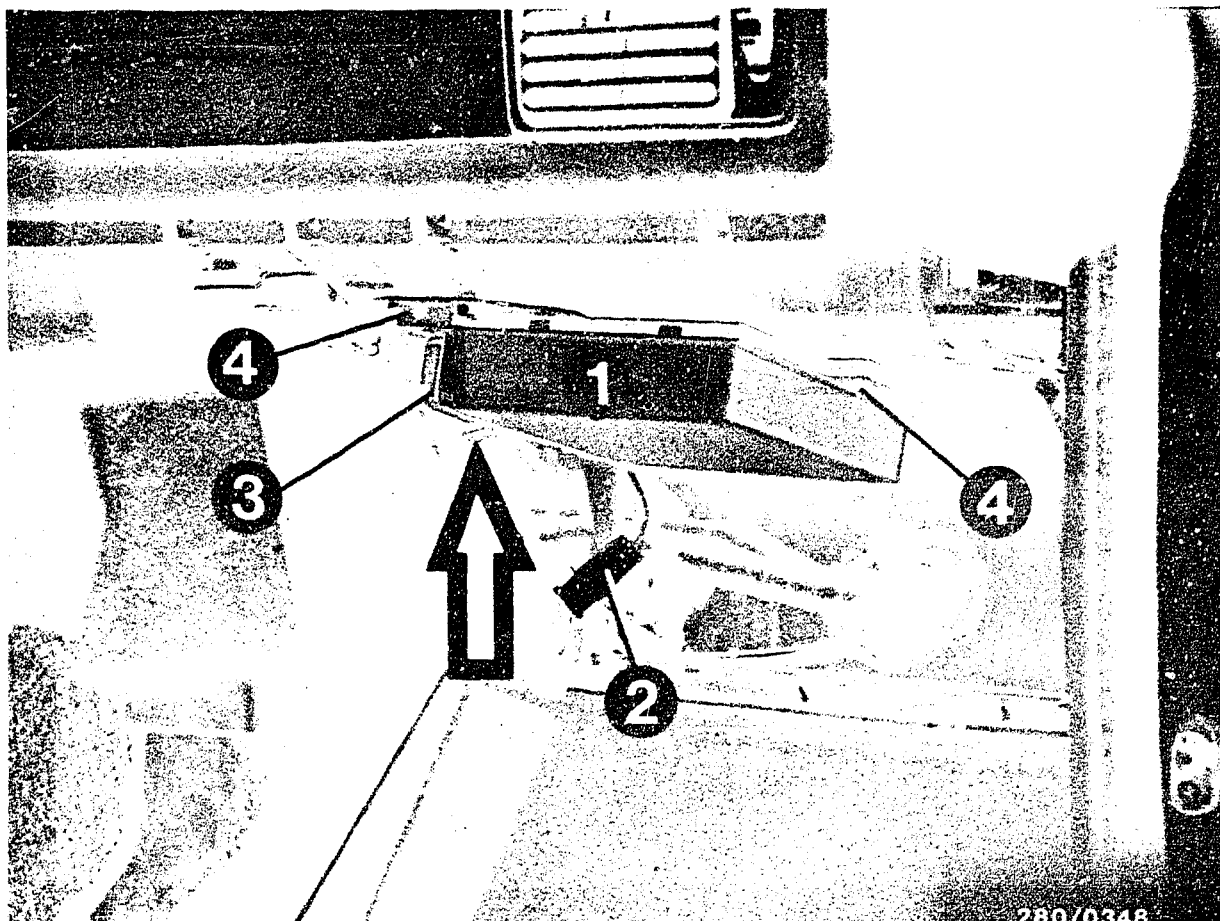
Installation position of components
BMW 5, 6 and 7 series



A17

Installation position of components
BMW 5, 6 and 7 series





- 1 = Control unit
- 2 = Plug-in connection term. 1 (lead No. 1)
- 3 = To connect the universal test adapter, remove multiple plug (25-pin). To do this, press the detent in the direction of the arrow.
- 4 = Fastening screws

Installation position of remaining components

The indications "right" and "left" apply when viewed from behind the vehicle.

Control unit

The control unit is located in the passenger compartment, on the front passenger side, in the glove compartment behind a cover.



Electric fuel pump:

Underneath vehicle, on right-hand side near rear axle.

Start valve:

On intake manifold, underneath throttle-valve assembly.

Fuel filter:

Underneath vehicle, on right-hand side near rear axle.

Ground terminal of electric fuel pump:

Underneath vehicle, on right-hand side, near electric fuel pump on rear axle support.

Electronics ground terminal
Output stage ground terminal:

In engine compartment, between 5th and 6th solenoid-operated injection valves.

Fuel-line-pressure damper:

In engine compartment, on left-hand side, underneath cooling water expansion tank mounting. (Near fuse box).

Auxiliary-air device:

On cylinder head, underneath throttle-valve assembly.



Important general information

1. Never start engine without securely connected battery.
2. Do not use a starting aid with more than 16 V or a fast charger for starting.
3. Never disconnect battery from vehicle electrical system with engine running.
4. Disconnect battery from vehicle electrical system when fast charging.
5. Remove control unit at temperatures above 80°C (paint drying installation).
6. Ensure that all connectors of wiring harness are properly attached.
7. Never connect or disconnect wiring-harness plug of control unit with ignition switched on.
8. When testing compression, cut the power supply by removing the control relay. This ensures that the voltage supply for the LE-Jetronic and therefore also for the injection valves is interrupted. Undesired injecting is thus prevented.
9. Remove the L-Jetronic control unit before carrying out electric welding work (e.g. spot welding).
10. When using the following trouble-shooting program it is assumed that the engine is in proper working order and that the ignition is correctly set. The electrical system must be checked and, if necessary, repaired.

In order to carry out the testing operations described in this manual and in order to assess the components, you should be familiar with the L-Jetronic and how it works. The essential points regarding the operation and construction of the L-Jetronic are described in Technical Instruction VDT-U3/3.



Trouble-shooting

The following trouble-shooting programs are designed to enable workshop employees, using the universal adapter with adapter lead (1 684 463 123) and other suitable test equipment, to quickly locate causes of trouble on the L-Jetronic. Depending on the level of knowledge and experience of the mechanic, a choice can be made between the following procedures:

- detailed step-by-step trouble-shooting for employees with little experience or practice on **LE**-Jetronic vehicles
- pin-pointed direct trouble-shooting for trained, experienced employees who have had a great deal of practice on **LE**-Jetronic vehicles.

B3**B5**

Both trouble-shooting programs begin by checking the electrical part of the **LE**-Jetronic with the aid of the universal adapter with adapter lead. In this way, the wiring harness with the connected components is soon checked for proper electrical operation and faults are quickly located.

If no fault is found using the universal adapter with adapter lead, continue trouble-shooting with the detailed or the direct trouble-shooting program.

B1

Trouble-shooting

BMW 5, 6 and 7 series

**B2**

Trouble-shooting

BMW 5, 6 and 7 series



1. Detailed step-by-step trouble-shooting

1.1 Test with universal adapter with adapter lead 1 684 463 123

This test must come at the beginning of the test program and must be performed from beginning to end (Coordinates B 9 - C11).

1.2 Trouble-shooting according to customer complaints (symptoms of trouble)

The table below contains possible symptoms of trouble and gives the first coordinate of the relevant detailed trouble-shooting program in the column on the right.

The trouble-shooting program consists of logically ordered test procedures for all individual components of the LE-Jetronic. If, after completing the trouble-shooting program for an assumed trouble, the fault has not been detected or remedied, take a new symptom of the trouble and work through another program.

<u>Customer complaint (symptom of trouble)</u>	<u>Universal adapter</u>	<u>Coordinate</u>
1. Engine fails to start or starts only with great difficulty	B 9	C12
2. Engine starts but then dies	B 9	D15
3. Uneven engine idle	B 9	E 9
4. Poor throttle take-up	B 9	F11
5. Engine misses under all operating conditions	B 9	G 1
6. Fuel consumption too high	B 9	G17
7. No maximum engine power, Top speed is not reached	B 9	H13
8. CO concentration at idle too high or too low	B 9	J 5

B3

Trouble-shooting

BMW 5, 6 and 7 series

**B4**

Trouble-shooting

BMW 5, 6 and 7 series



2. Pin-pointed direct trouble-shooting

2.1 Test with universal test adapter with adapter lead 1 684 463 123

The test with the universal test adapter must come at the beginning of the test program and must be performed from beginning to end (see Coordinates B 9 - C11).

2.2 Trouble-shooting according to customer complaints

The table below contains various symptoms of trouble with several possible causes of the trouble in each case. The coordinate reference field indicates the first coordinate of the test procedure for the respective LE-Jetronic components. If, after testing the individual components, the fault has not been detected or remedied, choose a new symptom of the trouble.

Customer complaint (symptom of trouble)

1. Starting motor operates, engine fails to start or starts only with great difficulty

2. Engine starts but then dies

3. Uneven engine idle, idle speed incorrect

4. Poor throttle take-up

5. Engine missing under all operating conditions

6. Fuel consumption too high

7. No maximum engine power

8. CO concentration at idle too high or too low

Cause (component fault)

B 9	B 9	B 9	B 9	B 9	B 9	B 9	B 9	Universal test adapter
C14	D17			G 3				Control relay defective
C16								Electric fuel pump not operating
D 7	E 3		F13					Auxiliary-air device not opening
		E13						Auxiliary-air device not closing
D 9		F 5	F17	G 5	H 7	J 1	J 9	Air-flow sensor defective

Continued on B 7/B 8

B5

Trouble-shooting
BMW 5, 6 and 7 series



B6

Trouble-shooting
BMW 5, 6 and 7 series



Customer complaint (symptom of trouble)

1. Starting motor operates, engine fails to start or starts only with great difficulty

2. Engine starts but then dies

3. Uneven engine idle, idle speed incorrect

4. Poor throttle take-up

5. Engine missing under all operating conditions

6. Fuel consumption too high

7. No maximum engine power

8. CO concentration at idle too high or too low

Cause (component fault)

D 3		E17						Start valve not opening
D 5	E 1	E19			H 3		J19	Start valve leaking
D 5		E21						Thermo-time switch defective
D11	E 5	F 7	F19			J 3	J21	Air-intake system leaking
D13		E15		G15				Solenoid-operated injection valves defective
C20	D21	F 1				H19	J13	Fuel pressure too low or zero; pressure regulator not operating
					H 1		J15	Fuel pressure too high; pressure regulator not operating
				G 9		H23		Fuel delivery too low
					H 5		J17	Temperature sensor II in engine defective
		E11	F13	G13				Throttle valve not closing (burbling)
						H15		Throttle valve not opening fully
				G 3				Poor central ground, loose contacts, faulty plug-in connections
D11	E 5	F 7	F19			J 3	J21	Open circuit in wiring harness and plug-in connections (interference, voltage peaks)
						H15		Throttle-valve switch defective
		F 9	F21		H 9		J 7	CO exhaust-gas setting too rich, idle adjustment
		F9	F21	G13			J 7	CO exhaust-gas setting too lean, idle adjustment
				G11				Control unit defective

B7

Trouble-shooting

BMW 5, 6 and 7 series



B8

Trouble-shooting

BMW 5, 6 and 7 series



Test list for the Universal test adaptor with
connected adaptor cable 1 684 463 123 for LE-
Jetronic in vehicles BMW 525i, 528i, 628CSi,
725i, 728i from 7.81

Test chart for universal adapter with adapter lead
connected - 2nd generation L-Jetronic

Test chart for Opel Rekord and Manta as of 10.81

Carefully plug the universal adapter onto the vehicle wiring harness (ignition must be off).

The universal adapter is used for testing the peripherals only. In order to obtain the measured values, connect to the universal adapter a multimeter for voltage and resistance measurements as well as a motortester.

The individual test steps are selected by means of two program switches (one for voltage measurements, the other for resistance measurements). Each program switch has 24 test positions, only some of which are occupied for the LE Jetronic. The tests with the universal test adapter must always be carried out completely. Be sure to observe the instructions given in the test chart!

In test steps 1-3, voltages are measured while starting.
Caution: Set the multimeter to "voltage measuring range"

In test steps 4 -12, resistances are measured.
Caution: Set the multimeter to "resistance measuring range".

Test specifications and operator information for the universal adapter are given in the following test chart.



Note:

In the following test steps a white surround in the "Operation" column indicates which operation is different from the preceding test step.

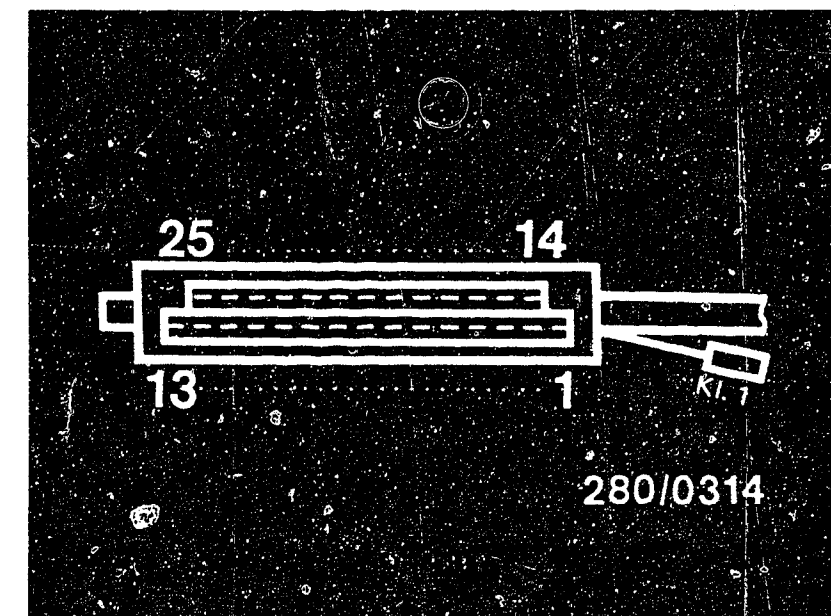
Test step: 1

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch position</u> "V"	5	On ignition oscilloscope:	<u>Component:</u> Signal from term. 1
<u>Program switch position</u> "Ω":	1) -	Ignition pulses	<u>Operation:</u> Triggering of control unit by the ignition
<u>Measuring equipment:</u> Motortester			
<u>Measuring range:</u> Special input . Control stick up against left- hand stop and measuring range 20V			<u>Malfunction:</u> No reading
<u>Connection:</u> Testwells		<u>Trouble-shooting:</u> For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	
<u>Operation in vehicle:</u> Ignition "ON" and operate starting motor		<u>Test the following leads for continuity using ohmmeter</u> (set value 0 Ω):	

From multiple plug term. 1 to ignition coil term. 1
From multiple plug term. 5 to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.

1) Switch position not specified.



Kl. = Terminal

Top view of multiple plug

Mounting position of
the components:

Ground terminals:
In the engine compartment,
between the 5th. and 6th.
electronic injection valves

B 10

Test chart for universal adapter
BMW 5, 6 and 7 series



B 11

Test chart for universal adapter
BMW 5, 6 and 7 series



Test step: 2			
Operation		Reading	Testing
Program switch position "V"	6	On multimeter 8 ... 15 V	Component: Control relay, voltage supply
Program switch position "Ω":	-	Read off.	
Measuring equipment: Multimeter (volt range)			Operation: Voltage supply
Measuring range: 0...15 V			Malfunction: No voltage reading
Connection: Test sockets red (positive) and black		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary. Test the following leads for continuity using ohmmeter (set value: approx. 0 Ω):	
Operation in vehicle: Ignition "ON" and operate starting motor		From multiple plug term. 9 to control relay term. 87 From control relay term. 30 to battery (positive terminal) Warning! disconnect battery! From multiple plug term. 5 to electronics ground terminal	

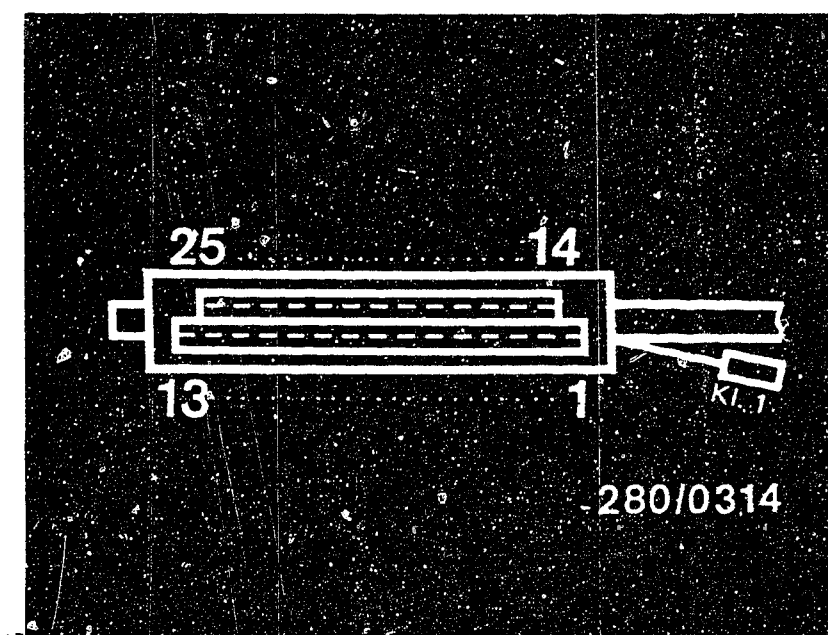
Eliminate contact resistances at the plug-in connections.

Installation position of components: 1. Control relay:

On the left inside the engine compartment next to the fuse box.

2. Ground terminals:

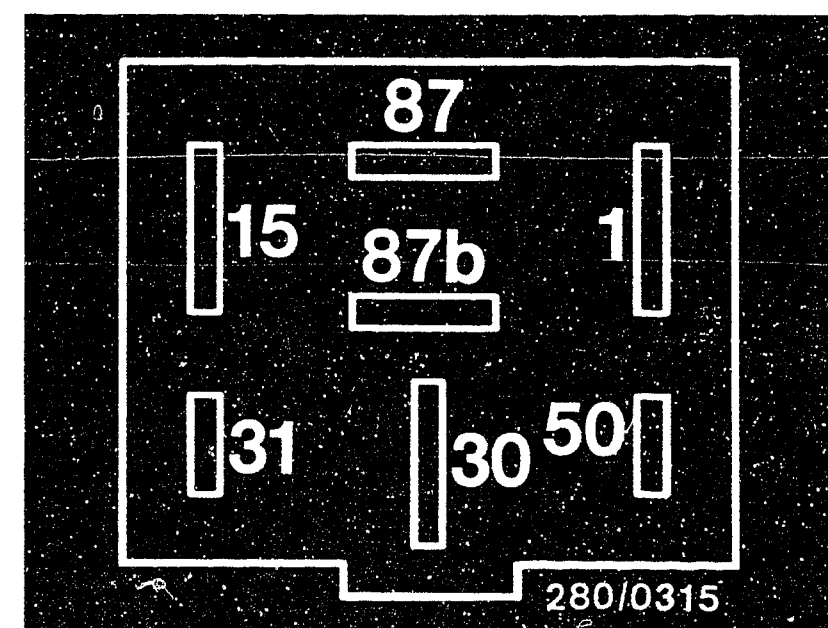
In the engine compartment between the 5th. and 6th. electronic injection valves.



Kl. = terminal

Top view of multiple plug

Control relay
(top view of connection base)



B12

Test chart for universal adapter
BMW 5, 6 and 7 series



B13

Test chart for universal adapter
BMW 5, 6 und 7 series



Test step: 3			
Operation		Reading	Testing
<u>Program switch position</u> "V"	7	on multimeter 8 ... 15 V	<u>Component:</u> Control relay, starting motor term. 50
<u>Program switch position</u> "Ω":	-	Read off	
<u>Measuring equipment:</u> Multimeter (volt range)			<u>Operation:</u> Starting signal.
<u>Measuring range:</u> 0 ... 15 V			<u>Malfunction:</u> No voltage reading
<u>Connection:</u> Test socket red (positive) and black		<u>Trouble-shooting:</u> For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary. <u>Test the following leads for continuity using ohmmeter</u> <u>(set value: approx. 0 Ω):</u>	
<u>Operation in vehicle:</u> Ignition "ON" and operate starting motor		From multiple plug term. 4 to control relay term. 50 From control relay term. 1 to ignition coil term. 1. From multiple plug term. 5 to electronics ground terminal	

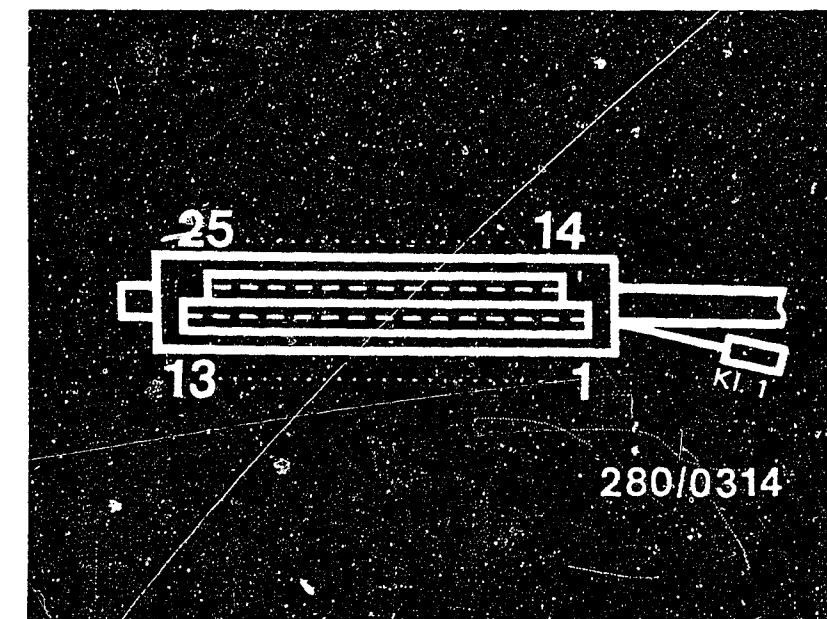
Eliminate contact resistances at the plug-in connections.

Installation position of components: 1. Control relay:

On the left inside the engine compartment next to the fuse box.

2. Ground terminals:

In the engine compartment between the 5th. and 6th. electronic injection valves.

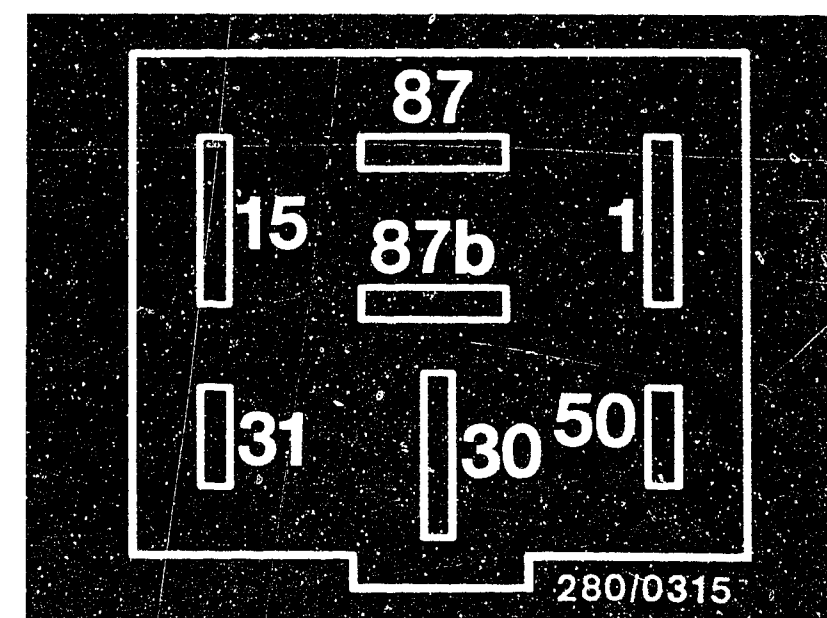


K1. = Terminal

Top view of multiple plug

Control relay
(top view of connection base)

L



B14

Test chart for universal adapter
BMW 5, 6 and 7 series



B15

Test chart for universal adapter
BMW 5, 6 and 7 series



Test step: 4			
Operation		Reading	Testing
Program switch position "V":	↓	on multimeter 100 ... 200 Ω	Component: Air-flow sensor (temperature sensor I)
Program switch position "Q":	11	Read off	
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between air-flow sensor term. 8 and electronics ground terminal
Measuring range: x 10 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle:		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω)

1. Auxiliary-air device

From output stage ground terminal term. 26 to auxiliary-air device term. 26.

From auxiliary-air device term. 9 to multiple plug term. 9.

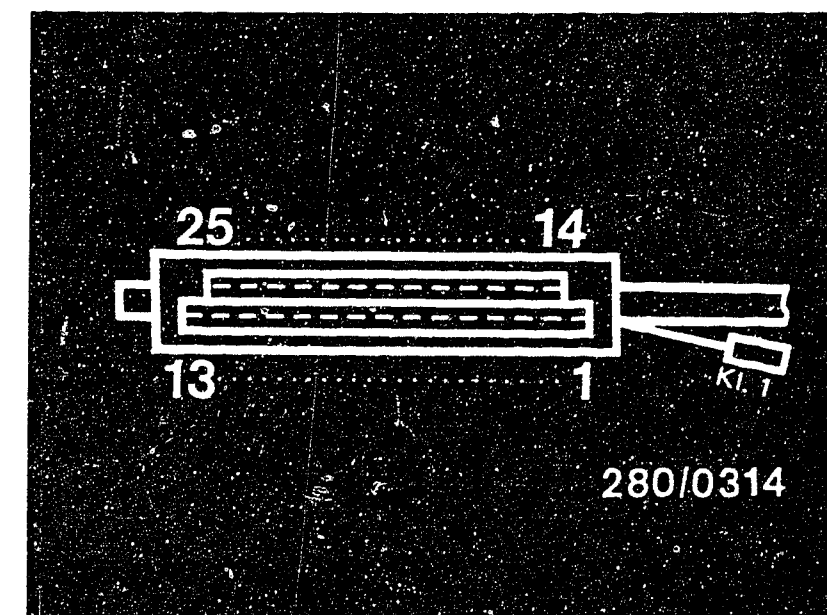
Resistance of auxiliary-air device at term. 26 and term. 9: 40...75 Ω

2. Electric fuel pump

From control relay term. 87b through pump fuse to electric fuel pump (positive terminal).

From electric fuel pump (negative terminal) to vehicle body ground terminal

Continued on B 18



K1. = Terminal

Top view of multiple plug

Mounting position of the components:

1. Auxiliary-air device:

On the cylinder head, below the throttle-valve assembly.

2. Electric fuel-pump:

Below the vehicle, to the right near the rear axle.

3. Pump fuse:

To the left in the engine compartment, in the fuse box (No. 1).

4. Ground terminals:

In the engine compartment, between the 5th. and 6th. electronic injection valves.

B 16

Test chart for universal adapter

BMW 5, 6 and 7 series



B 17

Test chart for universal adapter

BMW 5, 6 and 7 series



Test step: 4 (continued)

3. Air-flow sensor

From multiple plug term. 8 to air-flow sensor term. 8.
From air-flow sensor term. 5 to electronics ground terminal.

From multiple plug term. 5 to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.

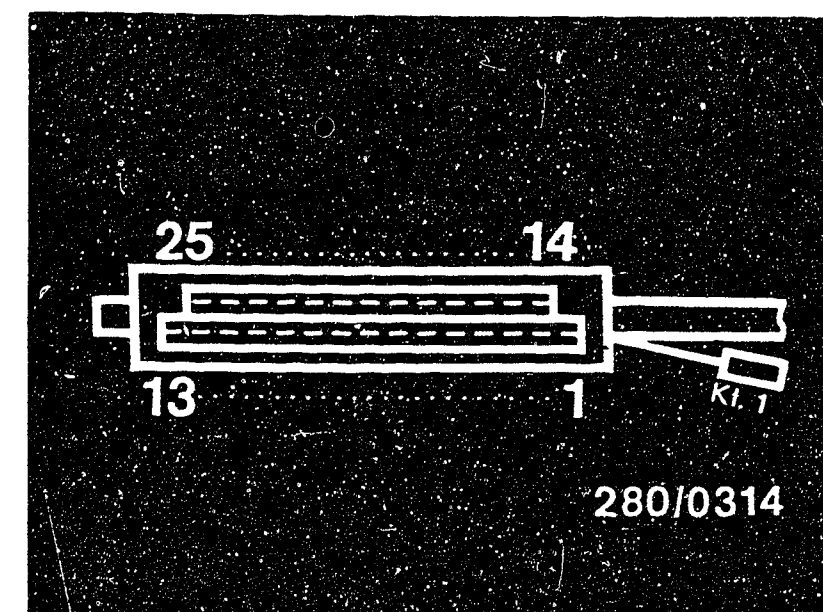


Test step: 5		Reading	Testing
Operation			
Program switch position "V"	↓	on multimeter 60 ... 1000 Ω	Component: Air-flow sensor (potentiometer)
Program switch position "0"	12	Read off.	
Measuring equipment: Multimeter (Ω - range)			Operation: Resistance between air-flow sensor term. 7 and electronics ground terminal
Measuring range: x 10 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle: Deflect air-flow sensor flap		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

From multiple plug term. 7 to air-flow sensor term. 7
 From air-flow sensor term. 5 to multiple plug term. 5
 From multiple plug term. 5 to electronics ground terminal

Eliminate contact resistances in the plug-in connections.



K1. = Terminal

Top view of multiple plug

Mounting position of the components:

- Air-flow sensor:
To the right in the engine compartment,
near the firewall.
- Ground terminals:
In the engine compartment, between the
5th. and 6th. electronic injection
valves.

B 19

Test chart for universal adapter
BMW 5, 6 and 7 series



B 20

Test chart for universal adapter
BMW 5, 6 and 7 series

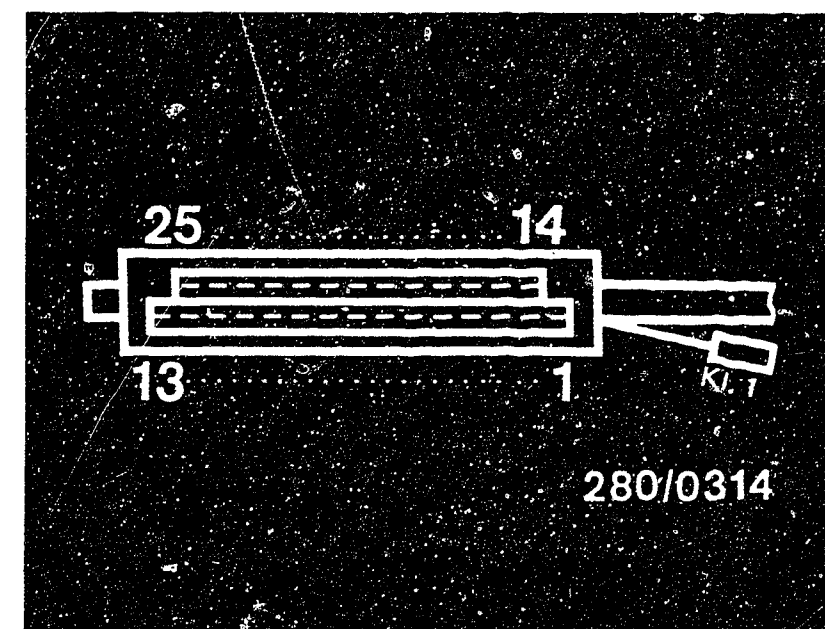


Test step: 6			
Operation		Reading	Testing
Program switch position "V":	↓	on multimeter 30 Ω ... 30 k Ω	Component: Temperature sensor II (engine)
Program switch position "Ω":	13	(depends on temperature) Read off.	
Measuring equipment Multimeter (Ω range)			Operation Resistance between control unit term. 10 and electronics ground terminal
Measuring range x 10 Ω or x 100 Ω			Malfunction Resistance outside tolerance
Connection Test sockets blue			
Operation in vehicle		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary. Measure resistance directly at engine temperature sensor (white plug). At ambient temperature (+15°C...30°C): 1.3...3.6 k Ω At operating temperature (approx. +80°C): 250...390 Ω	

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

From multiple plug term. 10 to temperature sensor II (engine) term. 10.
Lead 38 from temperature sensor II to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.



K1. = Terminal

Top view of multiple plug

Mounting position of the components:

1. Engine temperature-sensor
In the cooling-water circuit at the front on the engine block (white plug).

2. Ground terminals:
In the engine compartment, between the 5th. and 6th. electronic injection valves.

B21

Test chart for universal adapter
BMW 5, 6 and 7 series



B22

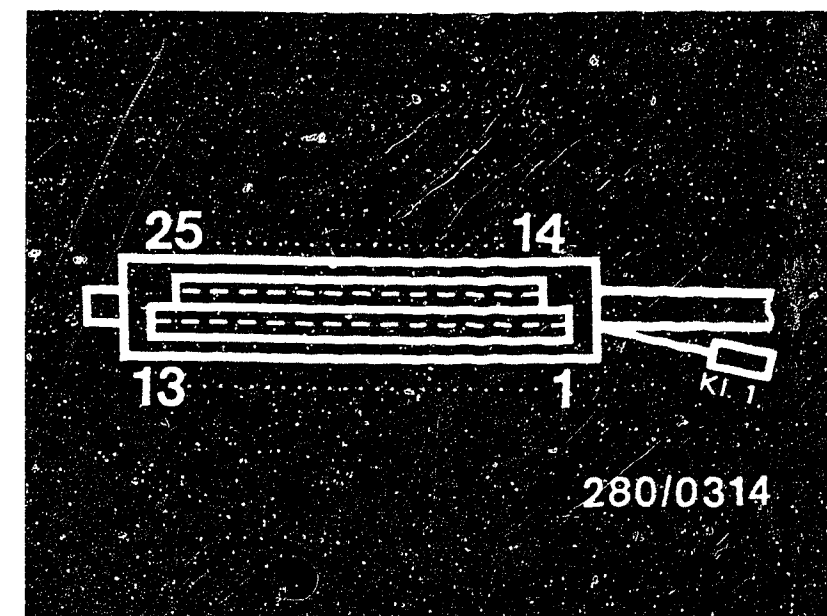
Test chart for universal adapter
BMW 5, 6 and 7 series



Test step: 7 Operation		Reading	Testing
Program switch position "V":	↓	on multimeter $0 \dots 10 \Omega$	Component: Ground connection of output stage
Program switch position "Ω":	14	Read off.	
Measuring equipment: Multimeter (Ω range)			Operation: Ground connection of control unit
Measuring range: $\times 1 \Omega$			
Connection: Test sockets blue			Malfunction: Resistance outside tolerance
Operation in vehicle:		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	

Test the following leads for continuity using ohmmeter (set value approx. 0Ω):
 From multiple plug term. 13 to output stage ground terminal.
 From multiple plug term. 5 to electronics ground terminal.

Eliminate contact resistances at the plug-in connections.



K1. = Terminal

Top view of multiple plug

Mounting position of the components:

Ground terminals:

In the engine compartment, between the 5th. and 6th. electronic injection valves.

B23

Test chart for universal adapter
BMW 5, 6 and 7 series



B24

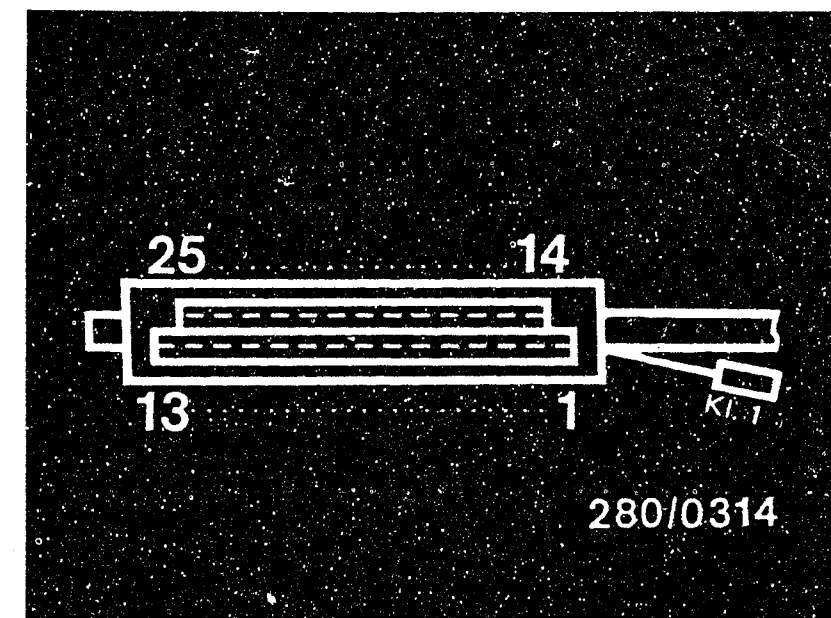
Test chart for universal adapter
BMW 5, 6 and 7 series



Test step 8 Operation		Reading	Testing
Program switch position "V"	↓	on multimeter 0 ... 10 Ω	Component: Output stage ground connection
Program switch position " Ω ":	15	Read off.	
Measuring equipment: Multimeter (Ω range)			Operation: Ground connection of control unit
Measuring range x 1 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle:		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):
 From multiple plug term. 25 to output stage ground terminal.
 From multiple plug term. 5 to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.



K1. = Terminal

Top view of multiple plug

Installation position of components:

Ground terminals:
 In engine compartment, between
 5th and 6th solenoid-operated
 injection valves.

C1

Test chart for universal test adapter
 BMW 5, 6 and 7 series



C2

Test chart for universal test adapter
 BMW 5, 6 and 7 series

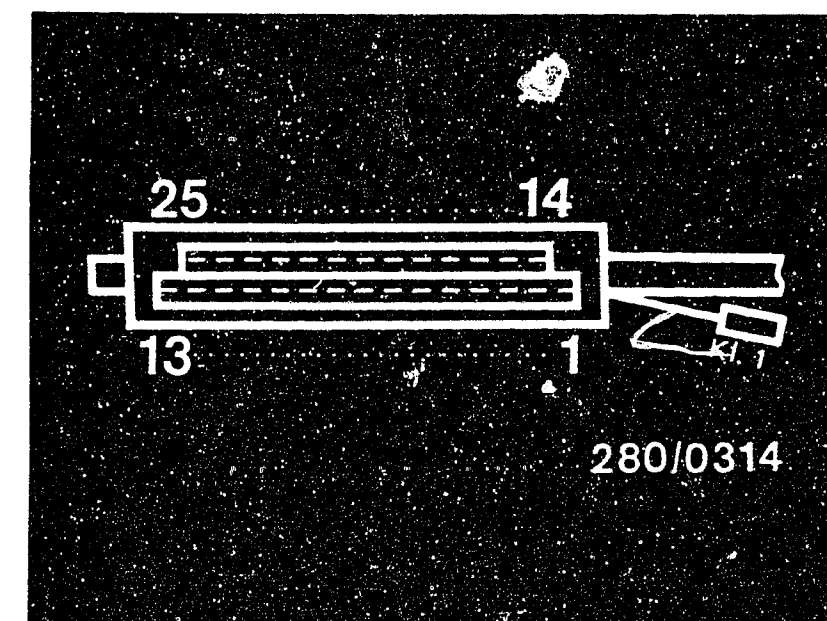


Test step 9 Operation		Reading	Testing
Program switch position "V"	↓	on multimeter approx 0 ... 10 Ω	Component: Throttle-valve switch (idle contact)
Program switch position " Ω "	16	Read off	
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between throttle- valve switch term. 2 and term. 9
Measuring range x 1 Ω			Malfunction: Resistance outside tolerance
Connection Test sockets blue			
Operation in vehicle: Accelerator in rest position		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	

Adjusting the throttle-valve switch (on intake manifold on right-hand side):
Slightly loosen the fastening screws of the throttle-valve switch. Connect ohm meter to throttle-valve switch between term. 2 and term. 9. Turn throttle-valve switch to the right until the idle contact (microswitch) can be heard to click. (Reading 0 Ω).
Checking the adjustment:
Pull on the throttle cable slightly. The idle contact (microswitch) must be heard to click.
(Reading ∞ Ω)

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):
From multiple plug term. 2 to throttle-valve switch term. 2
From throttle-valve switch term. 9 to multiple plug term. 9

Eliminate contact resistances in the plug-in connections.



K1. = Terminal

Top view of multiple plug

C3

Test chart for universal test adapter
BMW 5, 6 and 7 series



C4

Test chart for universal test adapter
BMW 5, 6 and 7 series



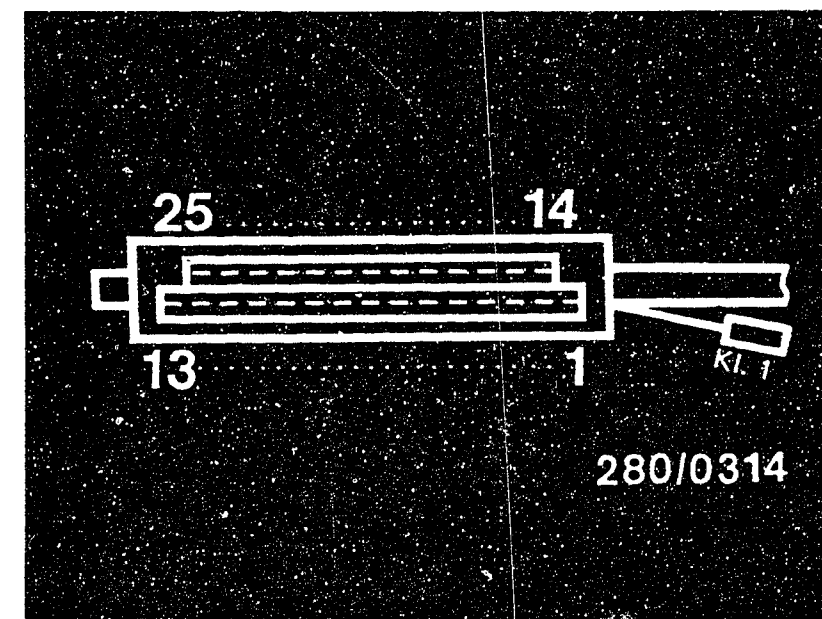
Test step 10 Operation		Reading	Testing
Program switch position "V":	↓	on multimeter approx. 0 ... 10 Ω	Component: Throttle-valve switch (Full-load contact)
Program switch position	17	Read off.	
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between throttle- valve switch term. 3 and term. 9
Measuring range: x 1 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle: Accelerator in full-load position		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

From multiple plug term. 3 to throttle-valve switch term. 3

From throttle-valve switch term. 9 to multiple plug term. 9

Eliminate contact resistances in the plug-in connections.



Top view of multiple plug

Kl. = Terminal

Installation position of components:

Throttle-valve switch:

On intake manifold at front

C5

Test chart for universal test adapter
BMW 5, 6 and 7 series



C6

Test chart for universal test adapter
BMW 5, 6 and 7 series



Test step 11 Operation		Reading	Testing
Program switch position "V"	↓	for multimeter + 20°C: 8,20..10,90 Ω + 80°C: 8,70..11,70 Ω	Component: Solenoid-operated injection valves 1, 2 and 3
Program switch position "Ω"	18	Read off.	Operation: Resistance of all 3 solenoid- operated injection valves (in parallel)
Measuring equipment Multimeter (Ω range)			Malfunction: Resistance outside tolerance
Measuring range x 1 Ω			
Connection Test sockets blue			
Operation in vehicle		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

From multiple plug term. 12 to the solenoid-operated injection valves.

From the solenoid-operated injection valves to control relay term. 87.

From the solenoid-operated injection valves to multiple plug term. 9.

Resistance measurement at solenoid-operated injection valve:

At ambient temperature (+15°C..30°C): 15...17,5Ω

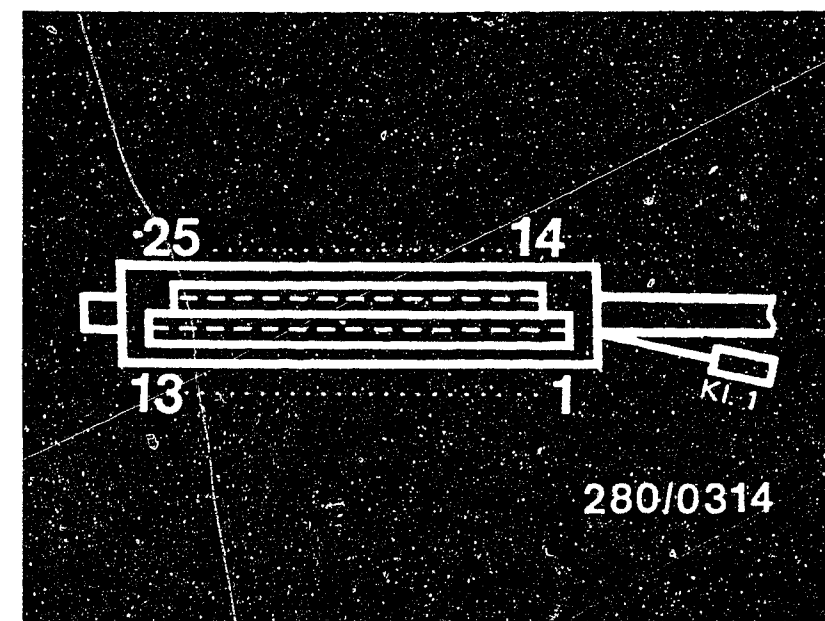
At operating temperature (approx. +80°C): 17...20,0Ω

If reading too high: Open circuit in valve coil or valve connector has dropped off.

Check seat of locking lugs.

Installation position of components:

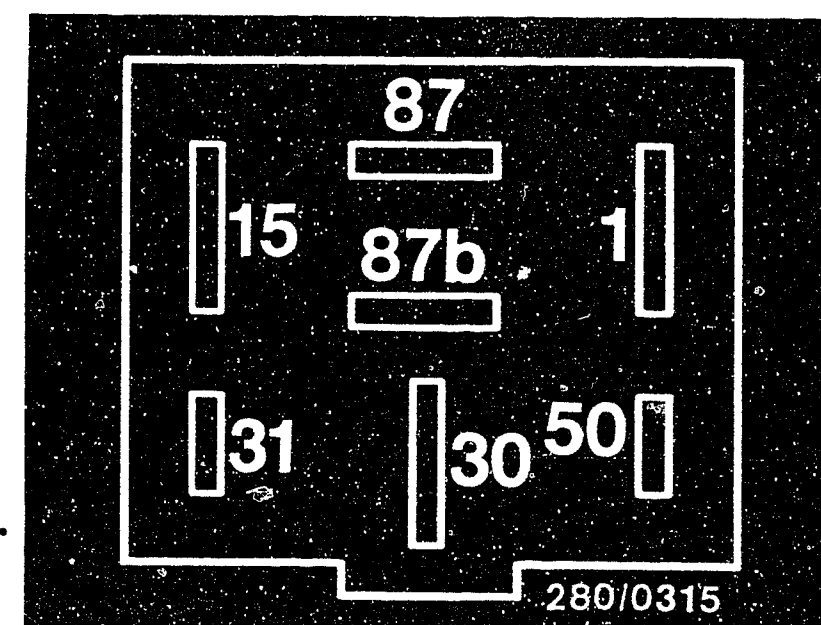
1. Injection valves: Between engine and intake manifold.
2. Control relay: In engine compartment on left-hand side, near fuse box.



Top view of multiple plug

KL. = Terminal

Control relay
(Top view of connection base)



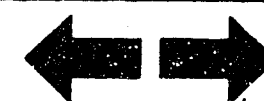
C7

Test chart for universal test adapter
BMW 5, 6 and 7 series

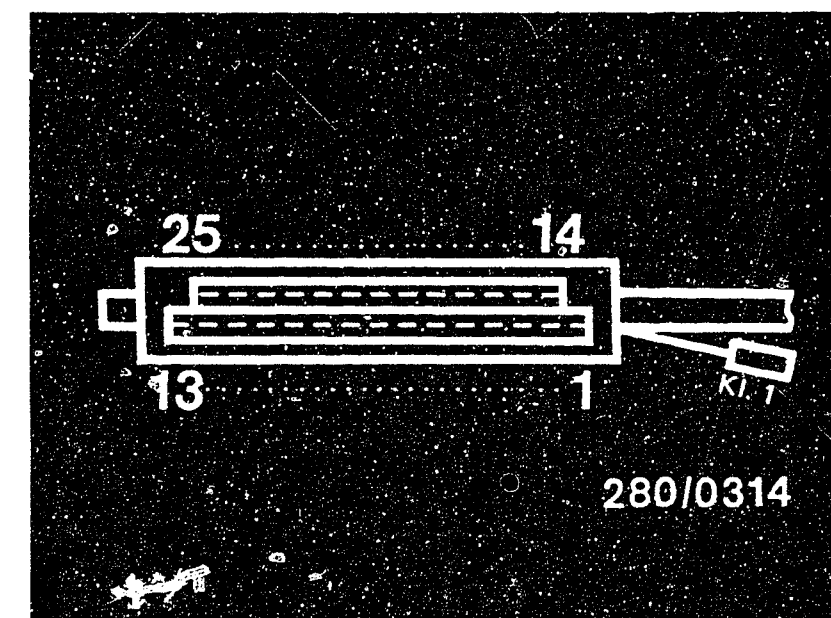


C8

Test chart for universal test adapter
BMW 5, 6 and 7 series

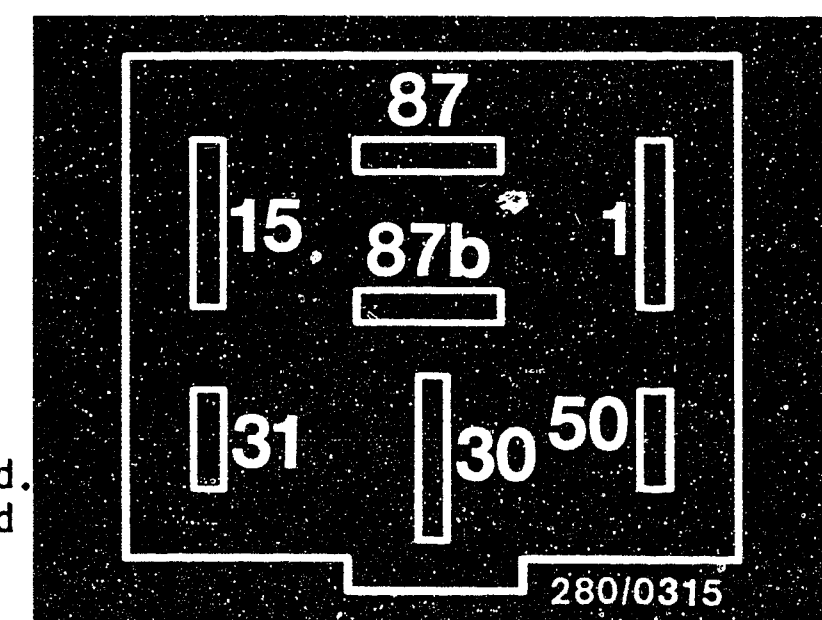


Test step 12 Operation		Reading	Testing
Program switch position "V"	↓	for multimeter + 20°C 8,20..10,90 Ω	Component: Solenoid-operated injection valves 4, 5 and 6
Program switch position "Ω":	19	+ 80°C: 8,70..11,70 Ω	
Measuring equipment Multimeter (Ω range)		Read off.	Operation: Resistance of all 3 solenoid- operated injection valves (in parallel)
Measuring range x 1 Ω			Malfunction: Resistance outside tolerance
Connection Test sockets blue			
Operation in vehicle		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	



Top view of multiple plug
Kl. = Terminal

Control relay
(Top view of connection base)



Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

From multiple plug term. 24 to the solenoid-operated injection valves.

From the solenoid-operated injection valves to control relay term. 87.

From the solenoid-operated injection valves to multiple plug term. 9.

Resistance measurement at solenoid-operated injection valve:

At ambient temperature (+15°C..30°C): 15...17,5Ω

At operating temperature (approx. +80°C): 17...20,0Ω

If reading too high: Open circuit in valve coil or valve connector has dropped off.

Check seat of locking lugs.

Installation position of components:

1. Injection valve: Between engine and intake manifold.
2. Control relay: In engine compartment on left-hand side, near fuse box.

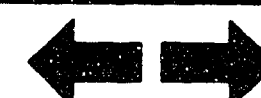
C9

Test chart for universal test adapter
BMW 5, 6 and 7 series



C10

Test chart for universal test adapter
BMW 5, 6 and 7 series



Testing with the universal adapter is now completed.
If the fault has not been found or if you require
further information and instructions on how to remedy
the fault, continue with the trouble-shooting program of
your choice.

Detailed trouble-shooting → see B 3

Direct trouble-shooting → see B 5



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

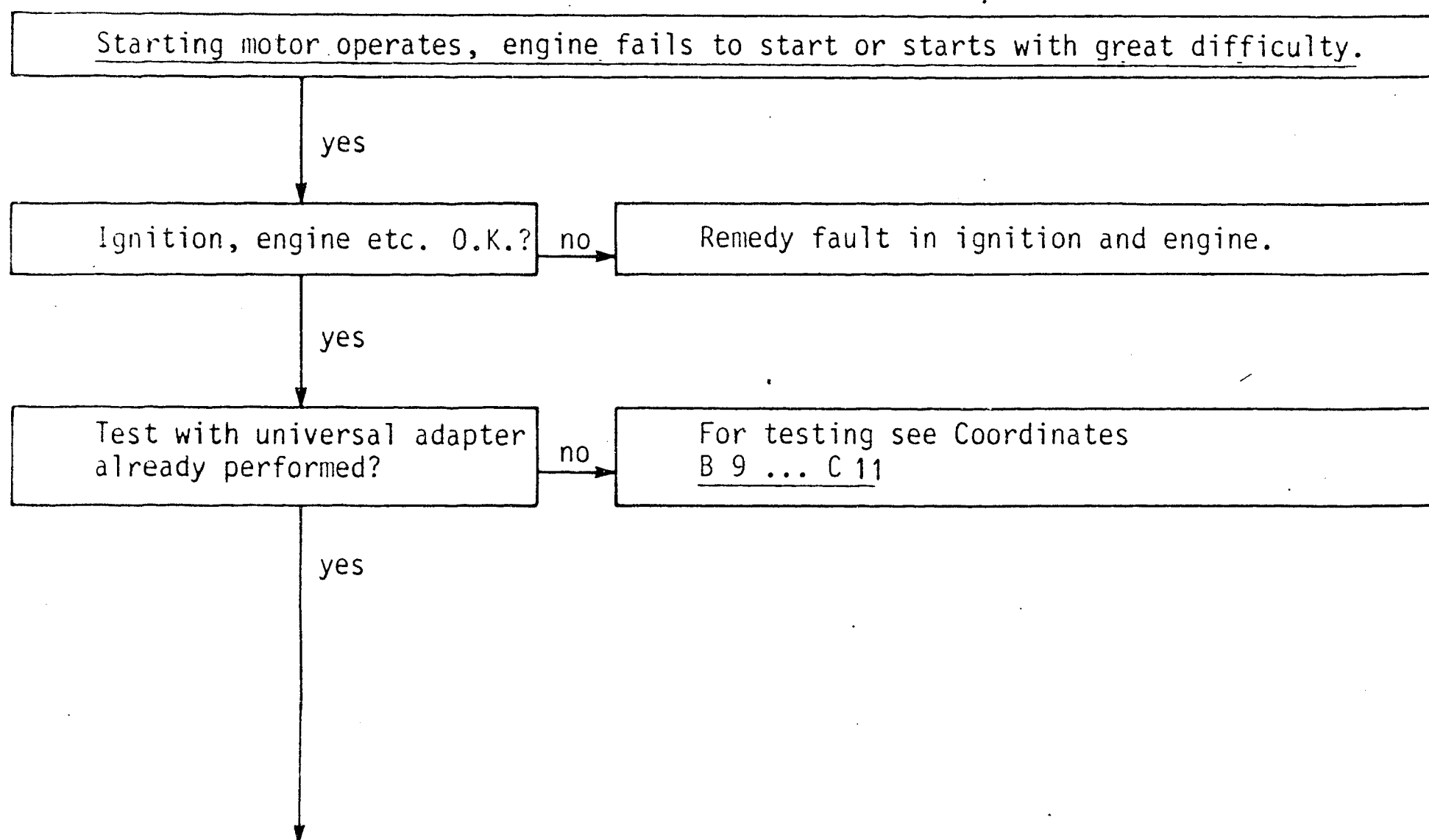
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on C 14/C 15

C12

Engine fails to start

BMW 5, 6 and 7 series



C13

Engine fails to start

BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty (contd.)

Fuel pump operating? (listen)
Control relay OK?

yes

no

1. Testing the control relay (remains plugged in during testing)
For testing, screw off the control relay base and turn round so that the connection base is accessible from below. Check the power supply. Switch on the ignition. Using voltmeter, measure battery voltage at term. 30, term. 15 and term. 50 (starting) to vehicle ground. Set value: 7 ... 15 V. If no voltage, check connecting cables.

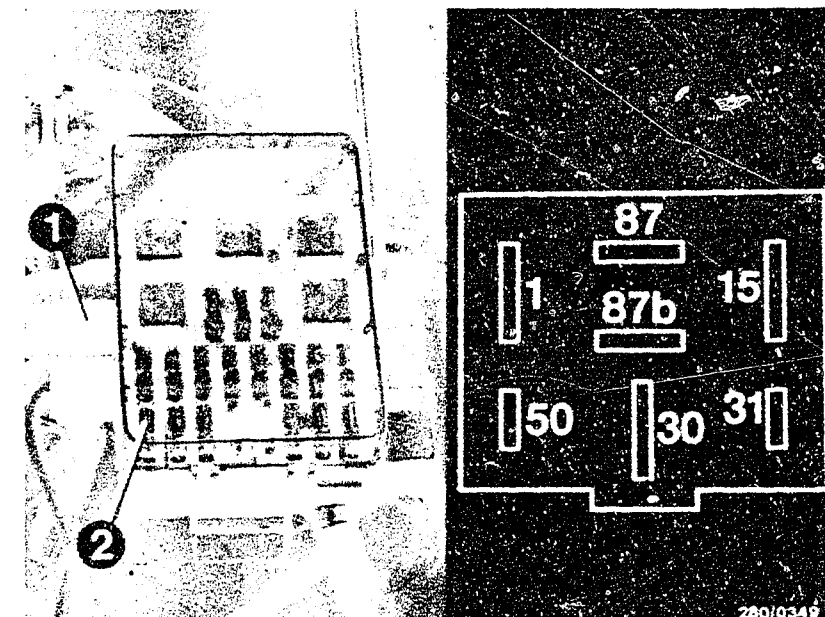
2. Start engine. Check voltage at pump fuse (in fuse box; No. 1)

Control relay term. 87b
Voltage at term. 87b → replace pump fuse.
No voltage at term. 87b → replace control relay.

3. Ground connection of fuel pump OK?

(Ground connection is on the rear axle support on the left-hand side, near the cable grommet for the electric fuel pump).

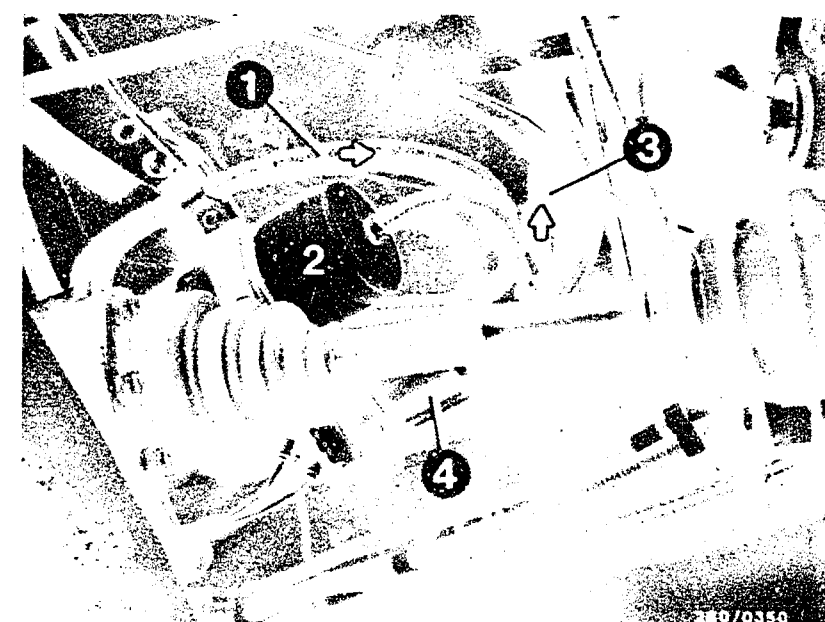
Continued on C16/C17



1 = Control relay
2 = Pump fuse

Connection base (viewed from below)

1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump



C14

Engine fails to start
BMW 5, 6 and 7 series



C15

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty (contd.)

Fuel pump operating? (Listen)
Control relay OK?
(continued)

no

4. Fuel pump operating?
If not → start engine and test voltage at
disconnected pump plug (set value min. 12V).
If voltage present → replace fuel pump.

yes

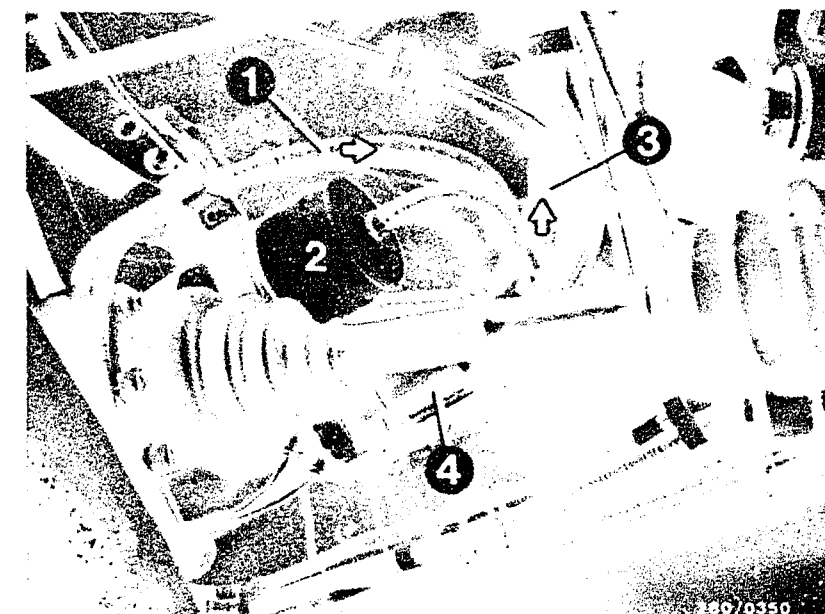
Fuel pressure OK?
Test specification 2.8 ... 3.2
bar
Test specification reached?

no

Testing the fuel pressure
Remove hose from fuel delivery line (con-
nection on fuel-distribution pipe). Connect
pressure gauge.
Caution! When tightening the fuel hose make
sure that no fuel gets onto hot parts of
the engine.

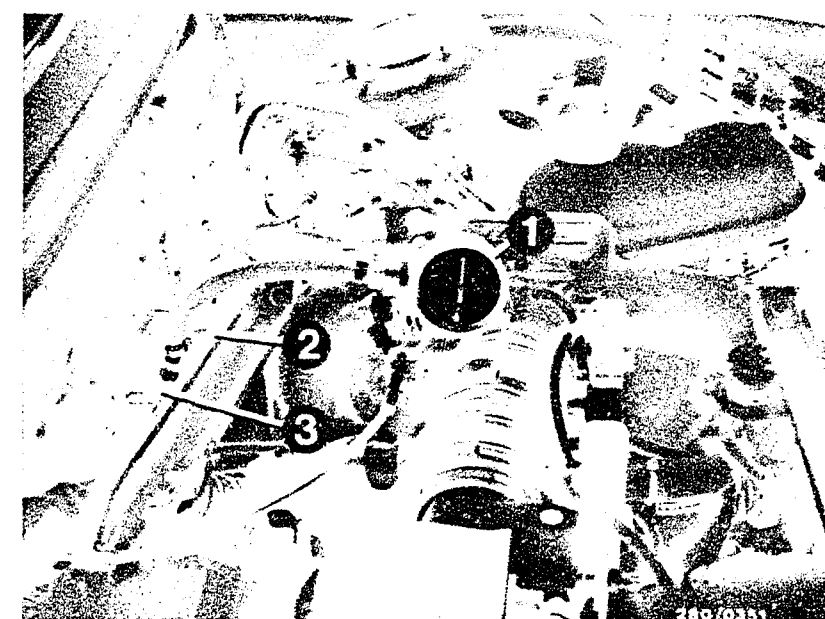
yes

Continued on C18/C19



1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump

1 = Pressure gauge (pressure tester
1 687 231 154)
2 = Fuel delivery line
3 = To fuel distribution pipe



C16

Engine fails to start
BMW 5, 6 and 7 series



C17

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty (contd.)

Fuel pressure OK?

Test specification: 2.8...3.2
bar

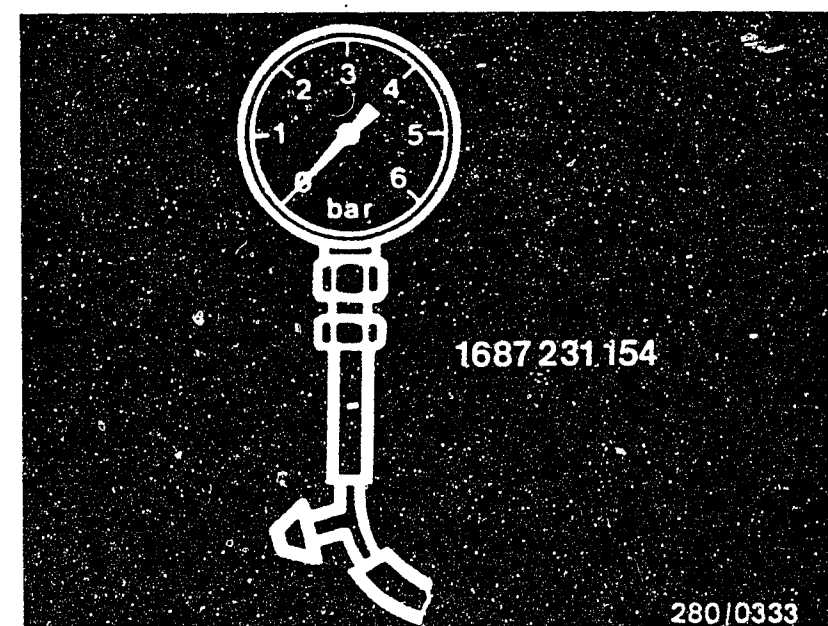
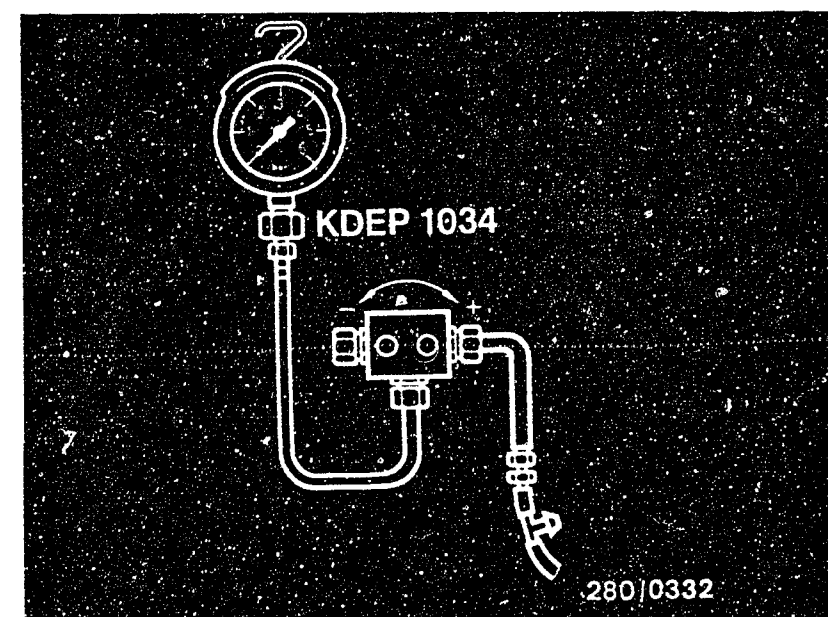
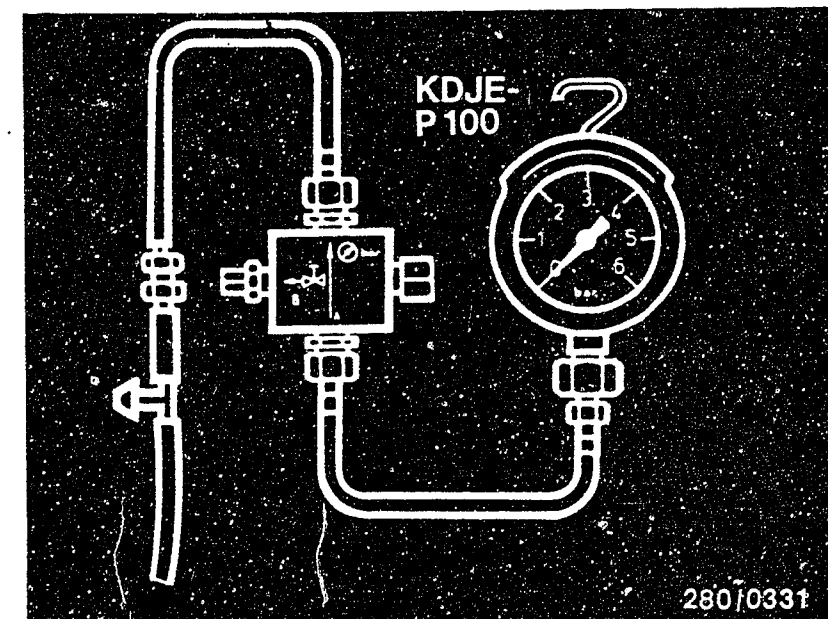
Test specification reached?

no

Connect the connections of the pressure testers into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic. The end of the hose is plugged onto the fuel-distribution pipe, and the free Y-piece is plugged onto the fuel delivery hose to the fuel-distribution pipe. Make sure there are no leaks.

yes

Continued on C20/C21



C18

Engine fails to start
BMW 5, 6 and 7 series



C19

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty (contd.)

Fuel pressure OK?
Test specification: 2.8...3.2 bar
Pressure regulator OK? Test specification reached?

no

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30. Fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Caution!

Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2,5 bar.

Testing the pressure regulator

Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30. Electric fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Fuel pressure of 2.8 bar not reached:

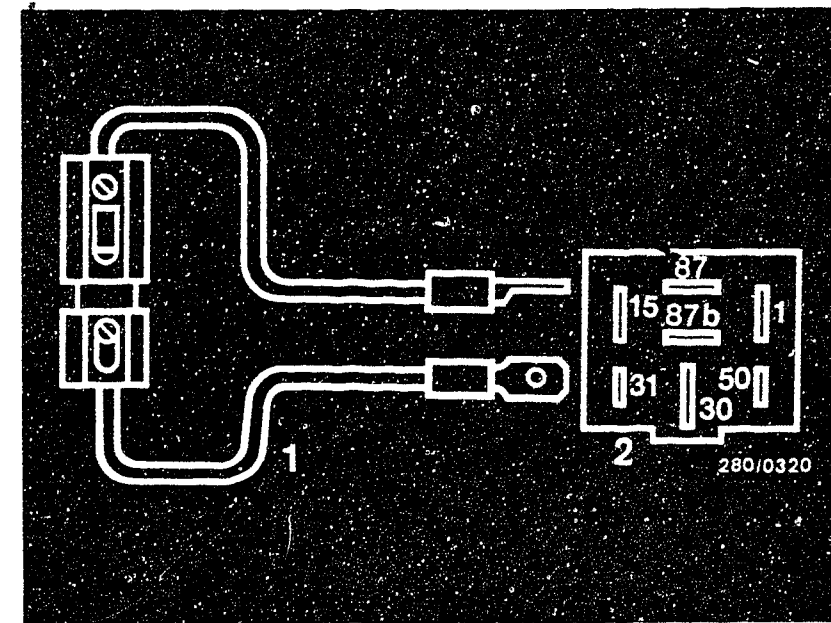
1. Slowly pinch off fuel return line: (Caution: do not load pressure gauge above 6 bar.)

Pressure rises above 4 bar → replace pressure regulator.

Pressure remains below 4 bar → replace fuel pump.

yes

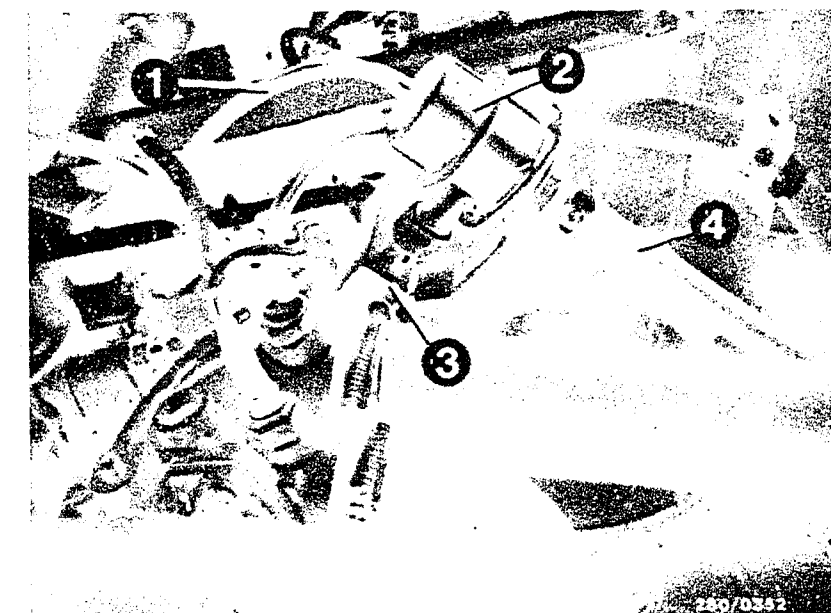
Continued on D1/D2



Jumper (user-fabricated)

1 = Fuse holder with 10 A fuse
2 = Top view of connection base

1 = Intake-manifold connection
2 = Pressure regulator
3 = Fuel delivery line
4 = Fuel return line



C20

Engine fails to start
BMW 5, 6 and 7 series



C21

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty (contd.)

Fuel pressure OK?
Test specification: 2.8...3.2
bar
Pressure regulator OK?
Test specification reached?

no

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 3.2 bar exceeded:

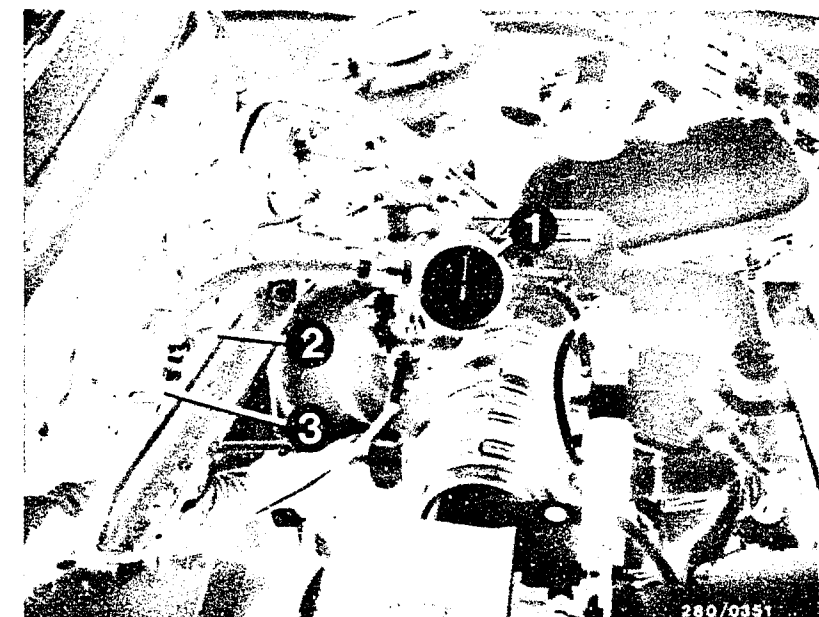
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!

Jumper must be removed again after test is completed, and the control relay must be fitted in position.

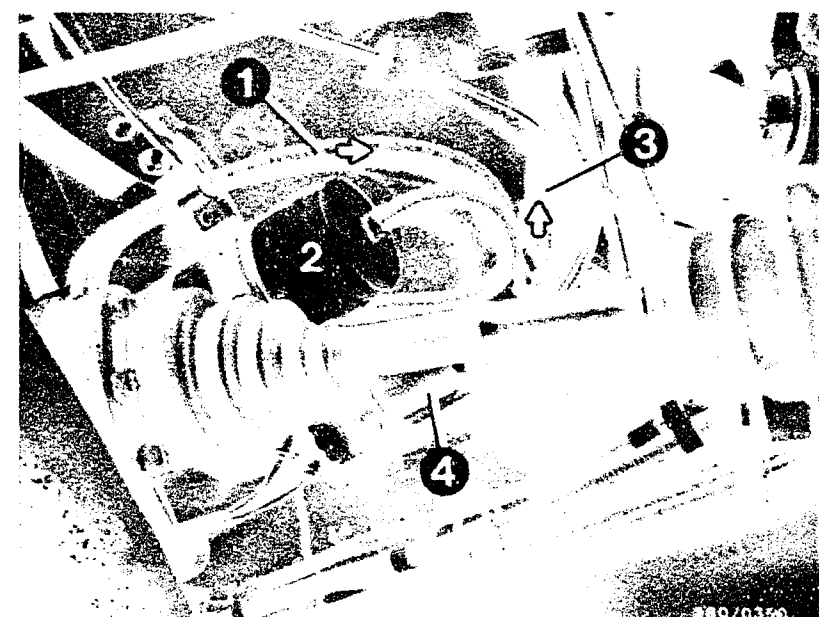
yes

Continued on D3/D4



- 1 = Pressure gauge (pressure tester 1 687 231 154)
2 = Fuel delivery line
3 = To fuel-distribution pipe

- 1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump



D1

Engine fails to start
BMW 5, 6 and 7 series



D2

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty (contd.)

Start valve OK?

no

Functional test:

Check the power supply to the start valve when starting. To do this, remove the plug from the start valve and connect voltmeter to term. 30 and term. 29/term. 4 of the start valve plug.

1. Coolant temperature at ambient temperature (+15°C...30°C): Voltage reading min. 6 V.

2. Coolant temperature at operating temperature (approx. +80°C): Voltage reading approx. 0 V.

Test the following leads for continuity using ohmmeter. Set value: approx. 0 Ω. Lead from term. 30 to thermo-time switch term. W. Lead from term. 29 to thermo-time switch term. G.

Lead from term. 4 to control relay term. 50. Check ground connection of thermo-time switch.

Electrical test of start valve:

Connect ohmmeter to start valve term. 29 and term. 30: Set value approx. 4 Ω.

Mechanical test of start valve:

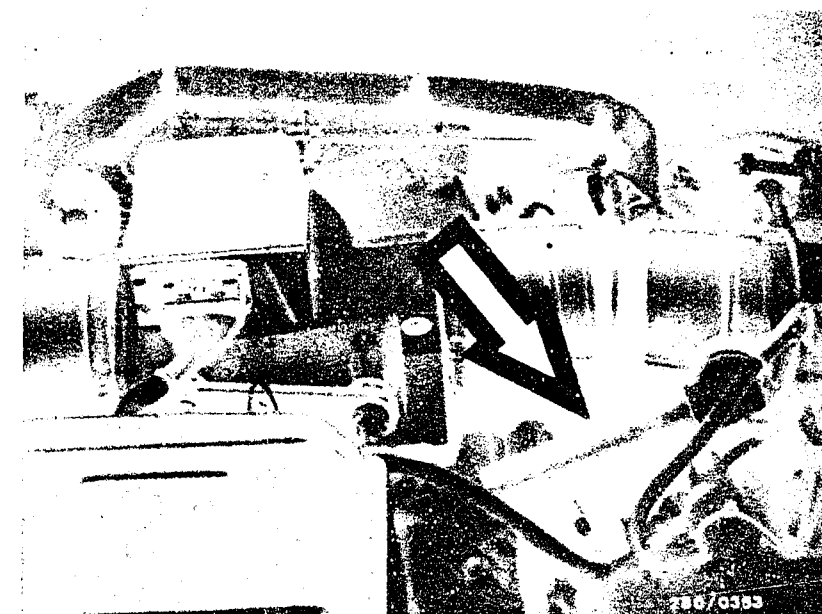
Remove start valve from the intake manifold and hold in a container. (Caution! fire hazard!)

When starting and at ambient temperature (+15°C...30°C) the start valve must squirt (max. 8 sec.).

At operating temperature (+80°C) the start valve must not squirt. With the ignition switched on and the pressure built up, the start valve must likewise not squirt.

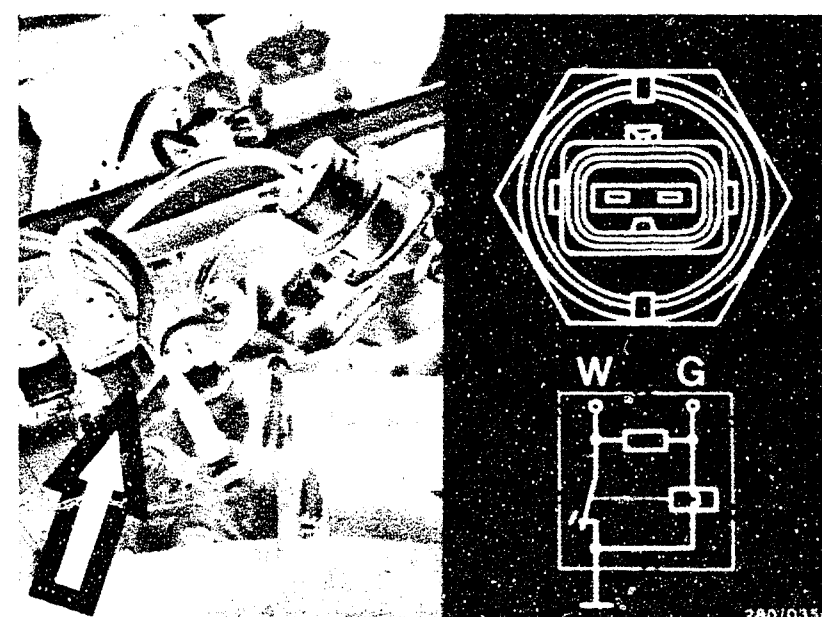
yes

Continued on D5/D6



Arrow = Start valve
(blue plug)

Arrow = Thermo-time switch



D3

Engine fails to start
BMW 5, 6 and 7 series



D4

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty

Start valve O.K.?
(continued)

no

Carry out squirt test at operating temperature (+80°C) as follows:

Remove plug from thermo-time switch and ground term. W.

Testing the start valve for leaks

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

Remove the start valve (caution! fire hazard!).

Fuel lines and electric leads remain connected (place collector vessel under the start valve).

Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).

Caution!

The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes

Thermo-time switch O.K.?

no

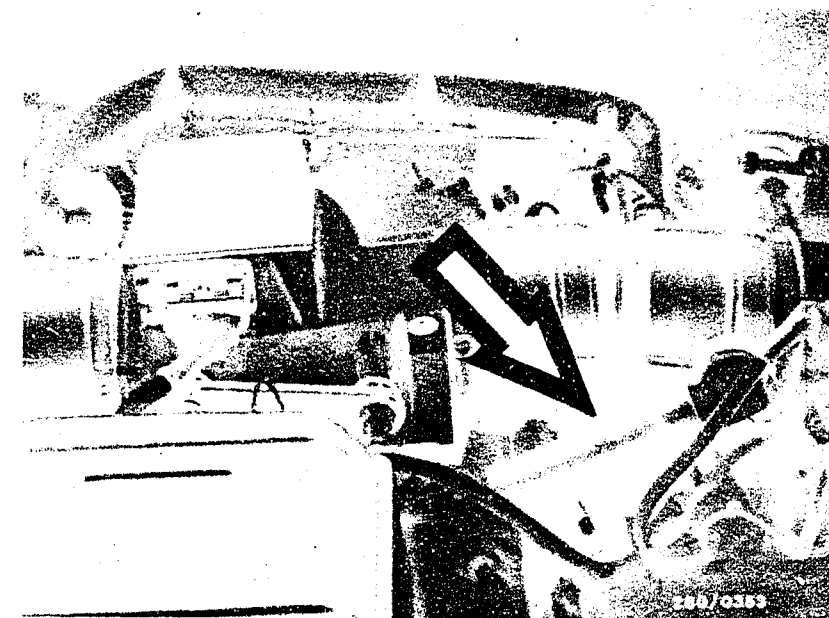
Electrical test:

Test the thermo-time switch 35°C/8 sec. as follows:

Remove the plug and measure resistance directly at thermo-time switch with ohmmeter.

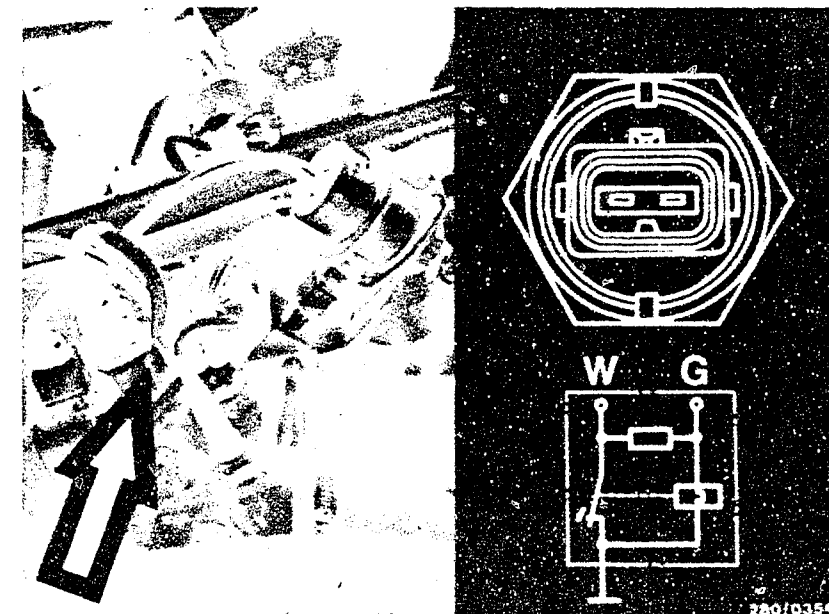
yes

Continued on D7/D8



Arrow = start valve
(blue plug)

Arrow = thermo-time switch



D5

Engine fails to start
BMW 5, 6 and 7 series



D6

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty

Thermo-time switch O.K.?
(continued)

no

1. Between term. "G" and ground at ambient temperature (below +30°C): 25...40 Ω
at operating temperature (above +40°C): 50...80 Ω
2. Between term. "W" and ground at ambient temperature (below +30°C): 0 Ω
at operating temperature (above +40°C): 100...160 Ω
3. Between term. "G" and "W" at ambient temperature (below +30°C): 25...40 Ω
at operating temperature (above +40°C): 50...80 Ω

yes

Auxiliary-air device tested?
(mechanically O.K.?)

no

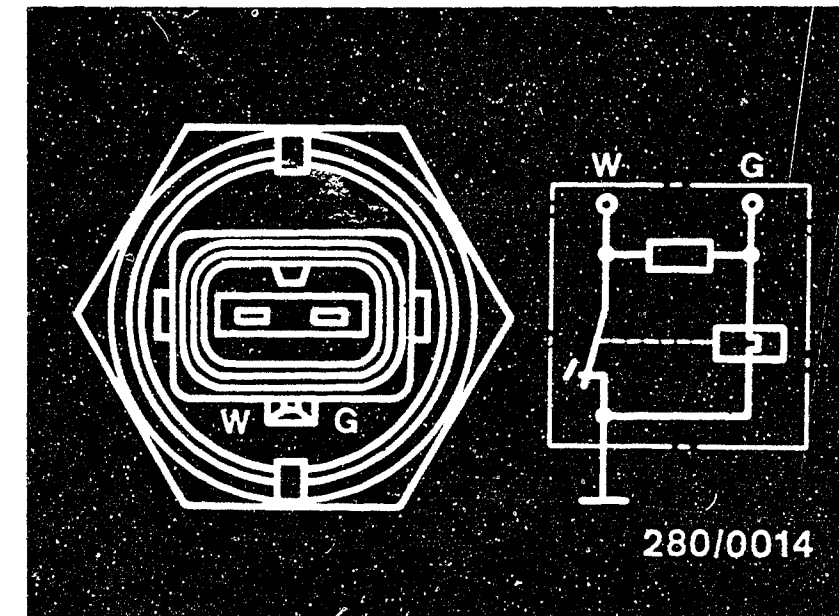
Testing:

1. Visual examination of auxiliary-air device:
Remove hoses and look down, using a small mirror if necessary. When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

yes

Continued on D9/D10



280/0014

Arrow=auxiliary-air device



D7

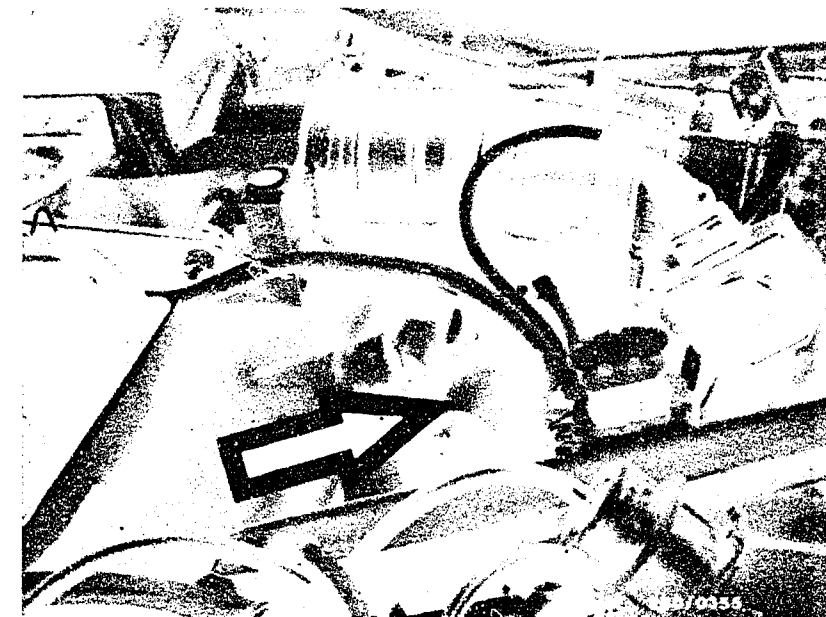
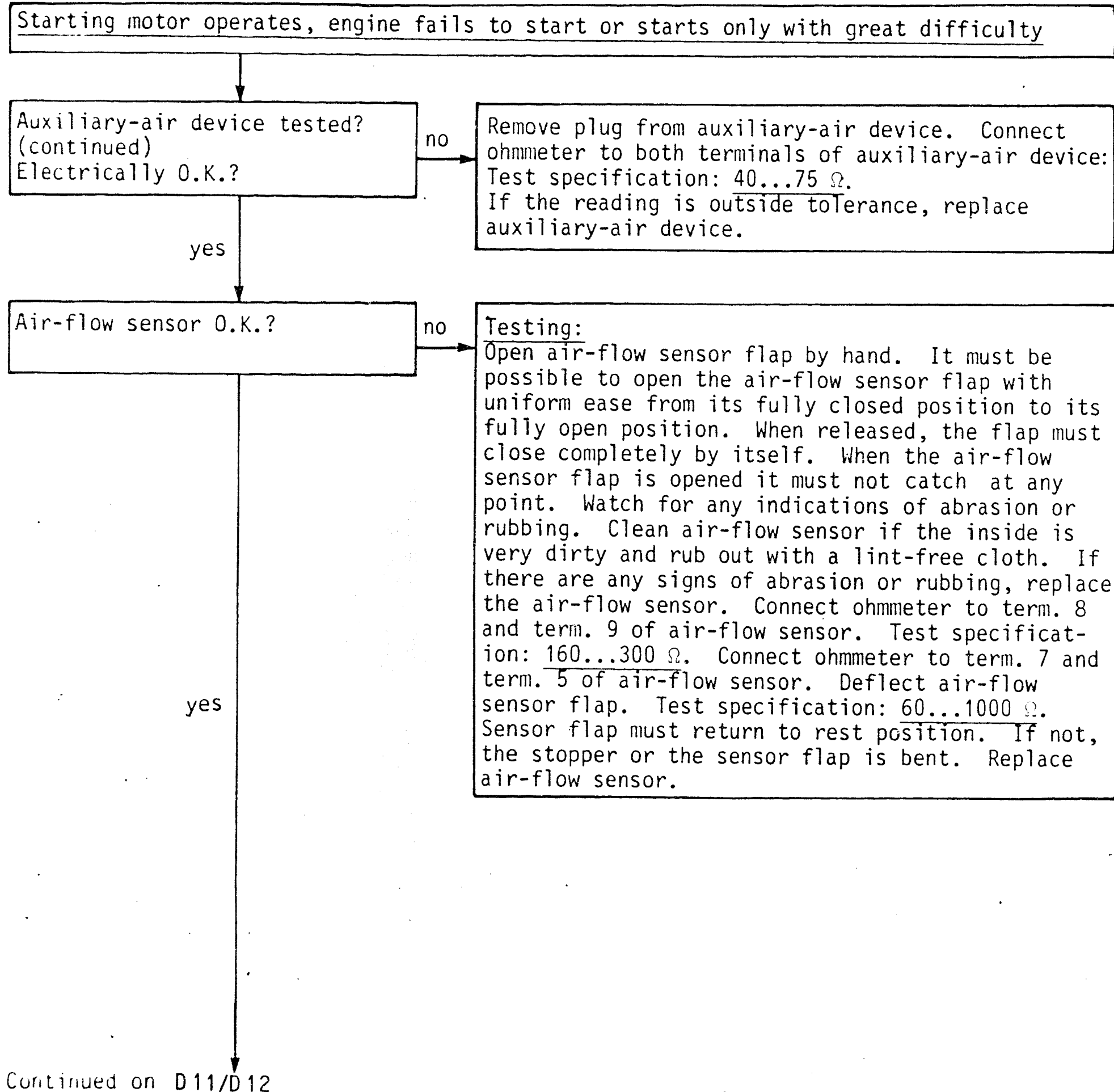
Engine fails to start
BMW 5, 6 and 7 series



D8

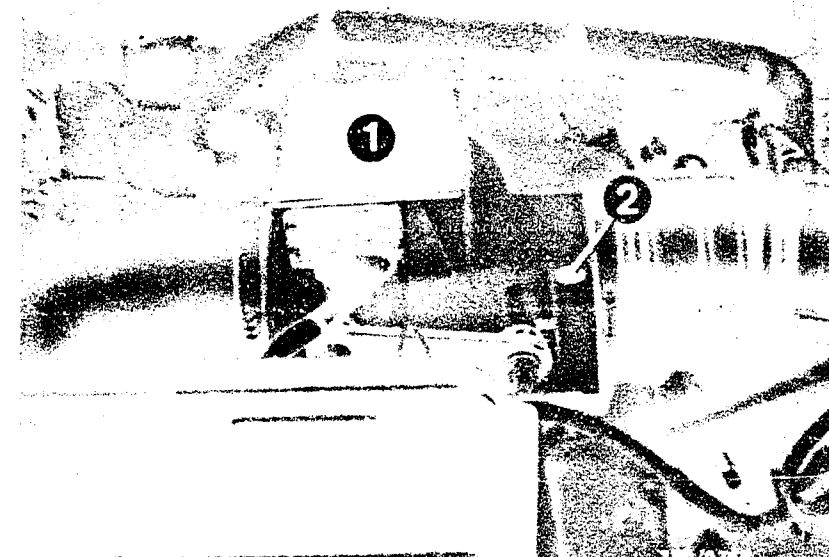
Engine fails to start
BMW 5, 6 and 7 series





Arrow=auxiliary-air device

1=Air-flow sensor
2=CO adjusting screw



D9

Engine fails to start
BMW 5, 6 and 7 series



D10

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty

Are all hose lines and electric leads securely attached? visual examination.
Is the air-intake system leak-tight?

no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

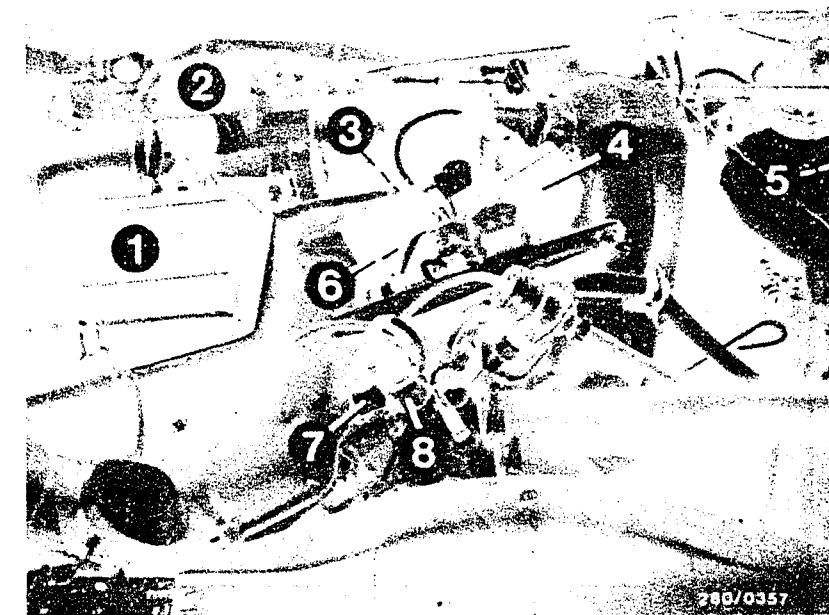
Checking for leaks:

Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

Check electric contacts for loose connection.

yes

Continued on D 13/D 14



- 1 = Air filter
- 2 = Air-flow sensor
- 3 = Start valve
- 4 = Throttle-valve switch
- 5 = Control relay
- 6 = Auxiliary-air device
- 7 = Temperature sensor II (white plug)
- 8 = Thermo-time switch

D11

Engine fails to start
BMW 5, 6 and 7 series



D12

Engine fails to start
BMW 5, 6 and 7 series



Starting motor operates, engine fails to start or starts only with great difficulty

Testing completed for customer complaint.

"Starting motor operates, engine fails to start or starts only with great difficulty"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B 3...B 8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B 3/B 4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

D 13

Engine fails to start
BMW 5, 6 and 7 series



D 14

Engine fails to start
BMW 5, 6 and 7 series



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

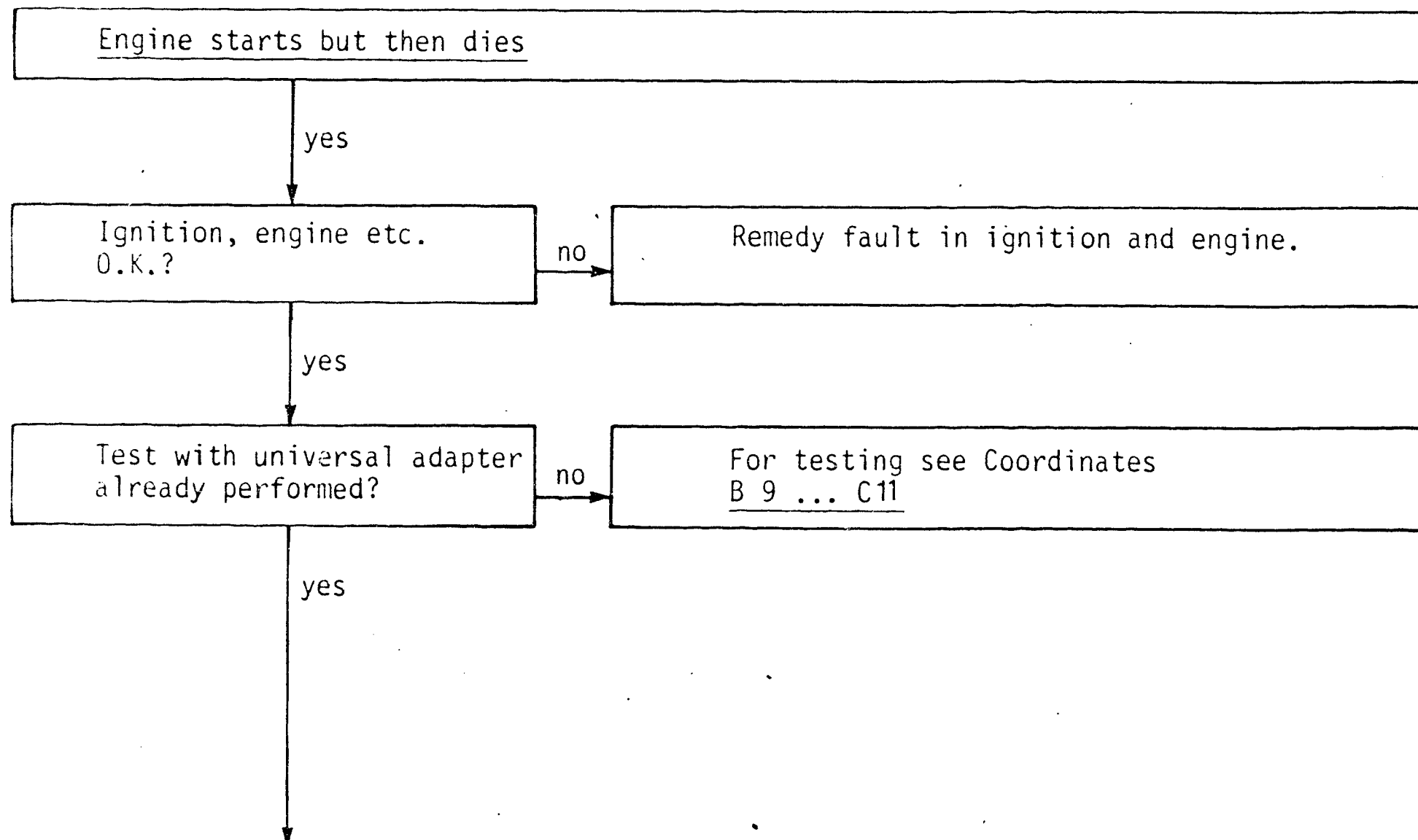
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on D17/D18

D 15

Engine starts but then dies
BMW 5, 6 and 7 series



D 16

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

Does fuel pressure remain constant after the engine has started?

no

Check the control relay:

Connect motortester with special input to control relay term. 1 and ground and start engine. Are voltage peaks visible on the oscilloscope? If not, test lead from control relay to ignition coil term. 1 for continuity using ohmmeter. Set value approx. 0 Ω .

If OK, check ignition system.

Further trouble-shooting:

Test the following leads for continuity using ohmmeter.

Set value approx. 0 Ω .

Lead 28 from control relay term. 87b to pump fuse and electric fuel pump and ground lead of electric fuel pump.

In addition, clean terminals and eliminate loose contacts.

yes

Fuel pressure OK?

Test specification 2.8...3.2 bar

Test specification reached?

no

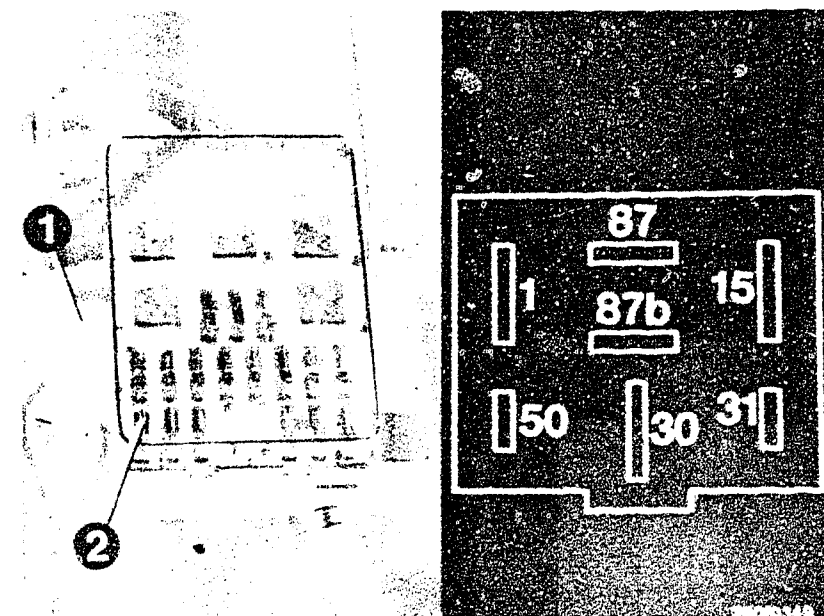
Testing the fuel pressure

Remove hose from the fuel delivery line (connection on fuel-distribution pipe). Connect pressure gauge.

Caution: when tightening the fuel hose make sure that no fuel gets onto hot parts of the engine.

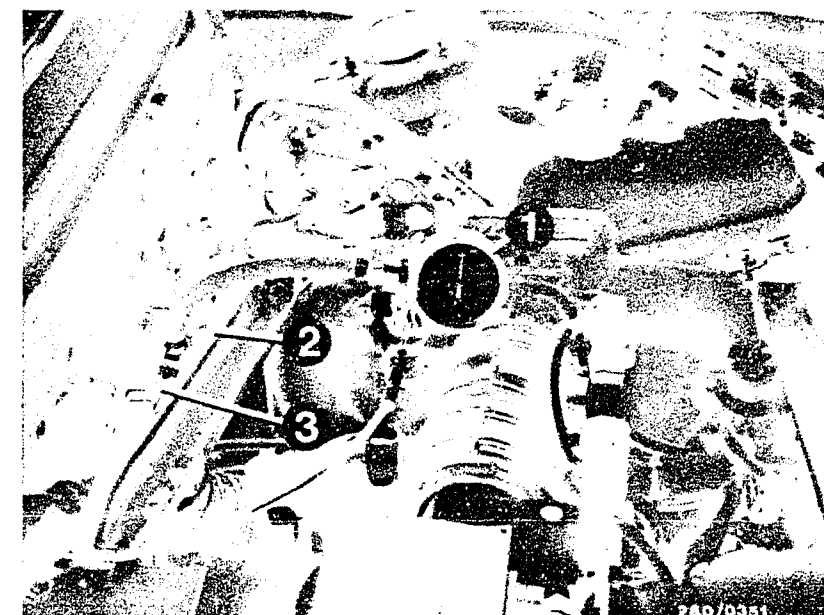
yes

Continued on D19/D20



- 1 = Control relay
- 2 = Pump fuse

- 1 = Pressure gauge (pressure tester 1 687 231 154)
- 2 = Fuel delivery line
- 3 = To fuel-distribution pipe



D17

Engine starts but then dies
BMW 5, 6 and 7 series



D18

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

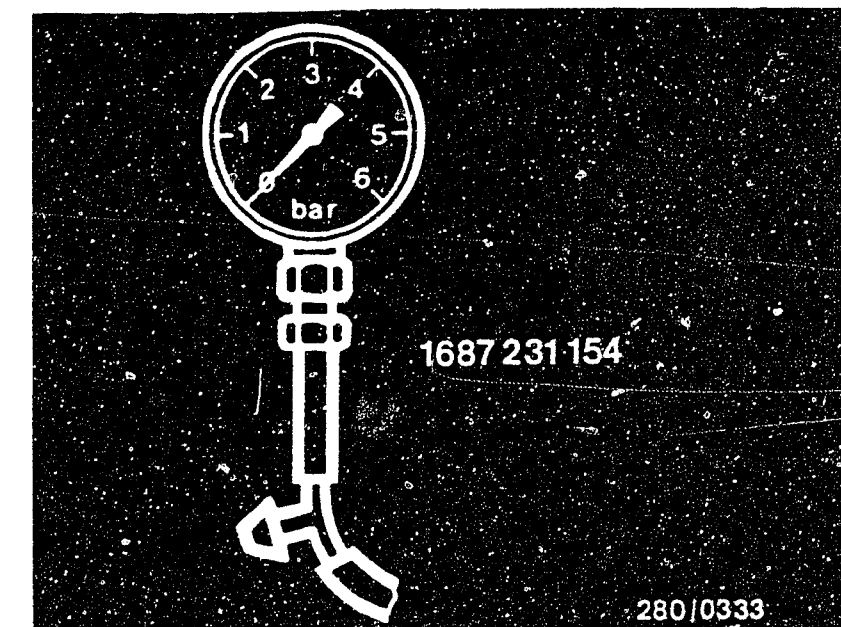
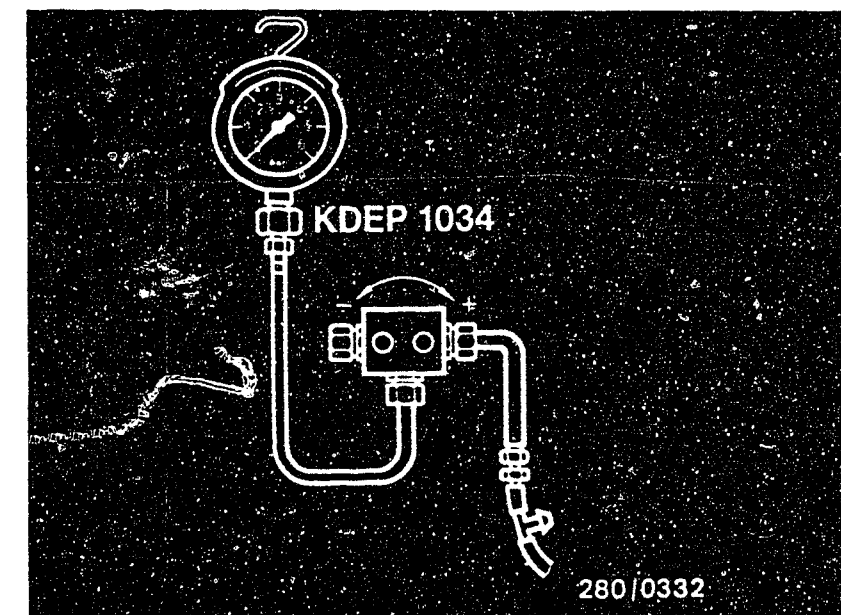
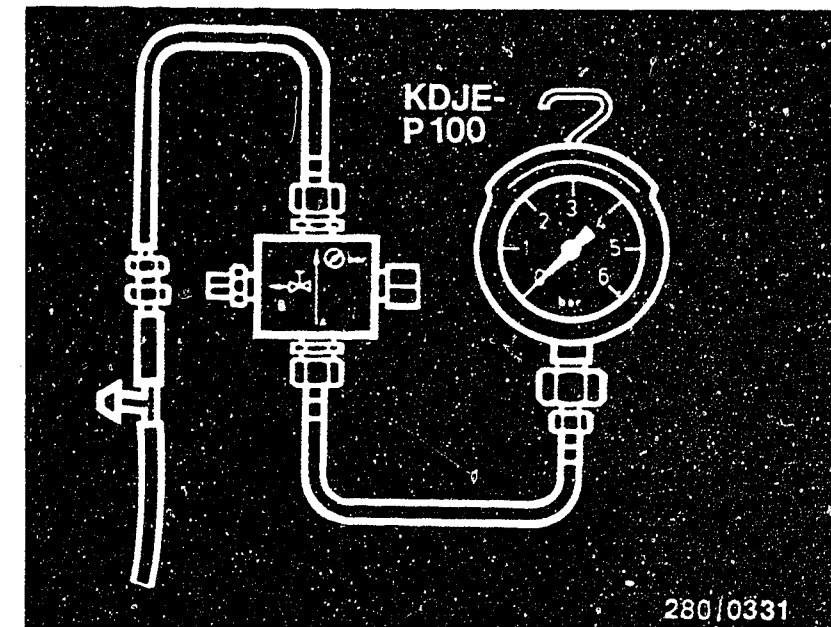
Fuel pressure OK?
Test specification: 2.8...3.2
bar
Test specification reached?

no

Connect the connections of the pressure testers into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic. The end of the hose is plugged onto the fuel-distribution pipe, and the free Y-piece is plugged onto the fuel delivery hose to the fuel-distribution pipe. Make sure there are no leaks.

yes

Continued on D21/D22



D 19

Engine starts but then dies
BMW 5, 6 and 7 series



D 20

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

Fuel pressure OK?
Test specification: 2.8...3.2 bar
Pressure regulator OK? Test specification reached?

no

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30. Fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Caution!

Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2,5 bar.

Testing the pressure regulator

Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30. Electric fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Fuel pressure of 2.8 bar not reached:

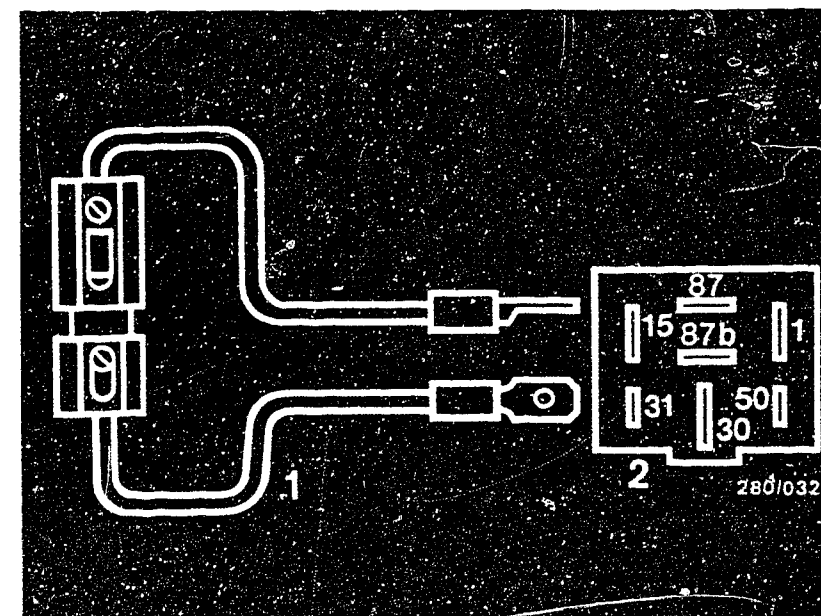
1. Slowly pinch off fuel return line: (Caution: do not load pressure gauge above 6 bar.)

Pressure rises above 4 bar → replace pressure regulator.

Pressure remains below 4 bar → replace fuel pump.

yes

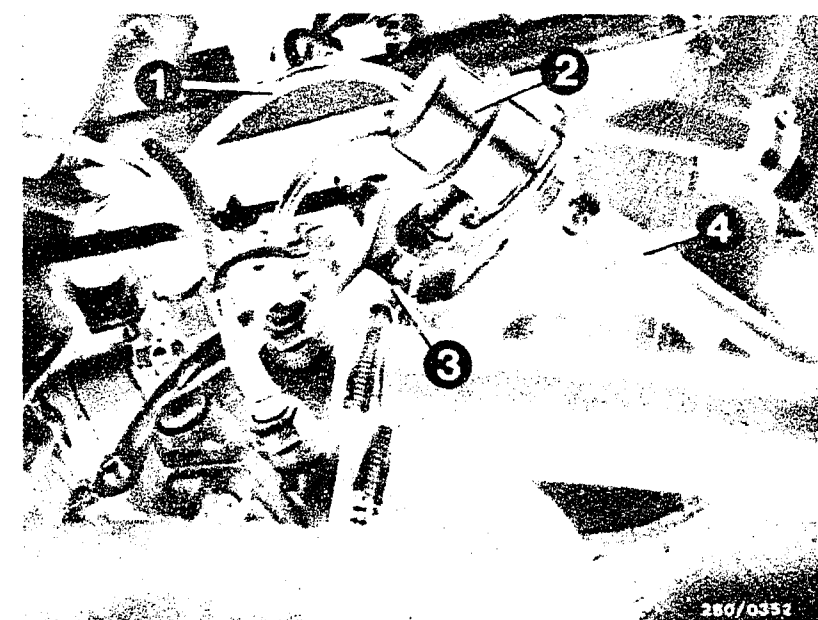
Continued on D23/D24



Jumper (user-fabricated)

- 1 = Fuse holder with 10 A fuse
- 2 = Top view of connection base

- 1 = Intake-manifold connection
- 2 = Pressure regulator
- 3 = Fuel delivery line
- 4 = Fuel return line



D21

Engine starts but then dies
BMW 5, 6 and 7 series



D22

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

Fuel pressure OK?
Test specification: 2.8...3.2
bar
Pressure regulator OK?
Test specification reached?

no

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 3.2 bar exceeded:

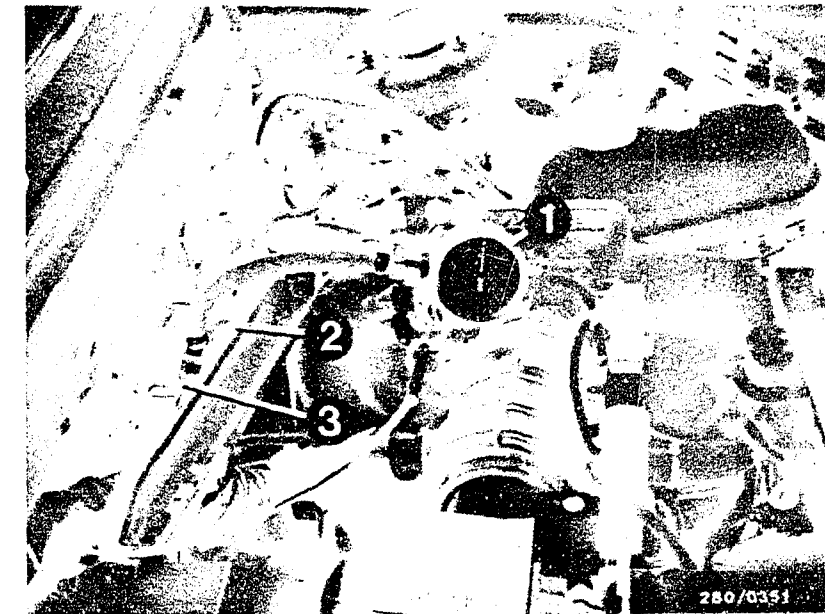
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!

Jumper must be removed again after test is completed, and the control relay must be fitted in position.

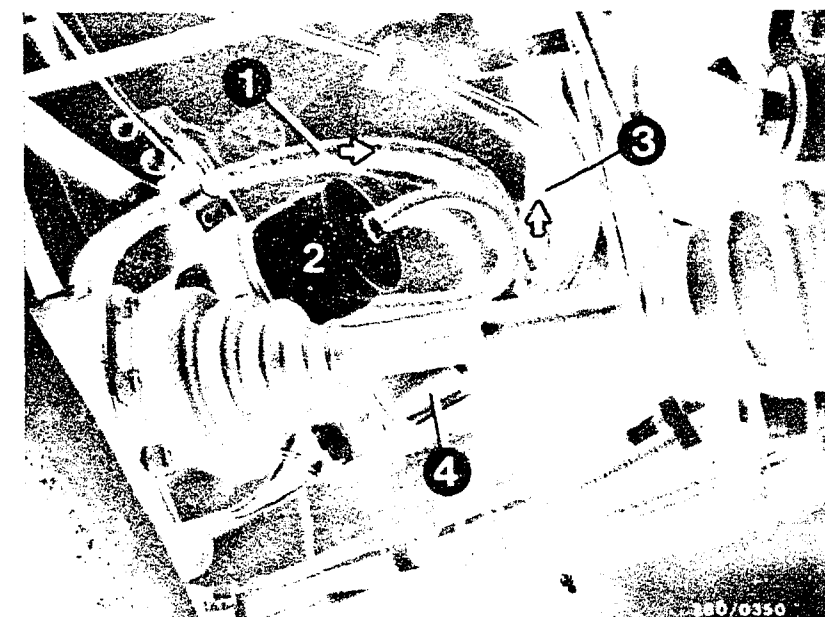
yes

Continued on E1/E2



- 1 = Pressure gauge (pressure tester
1 687 231 154)
2 = Fuel delivery line
3 = To fuel-distribution pipe

- 1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump



D23

Engine starts but then dies
BMW 5, 6 and 7 series



D24

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

Start valve O.K.?
(leak test)

no

Testing the start valve for leaks

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).

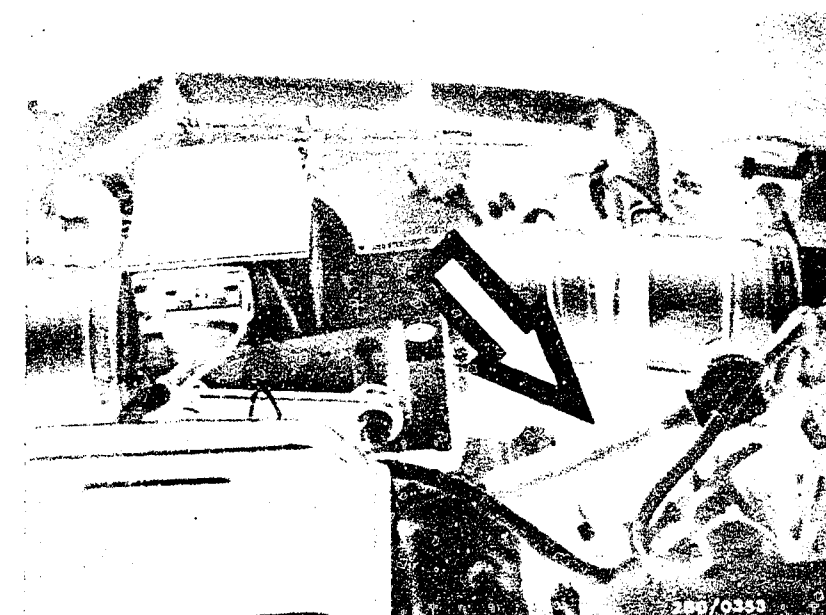
Caution!

The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

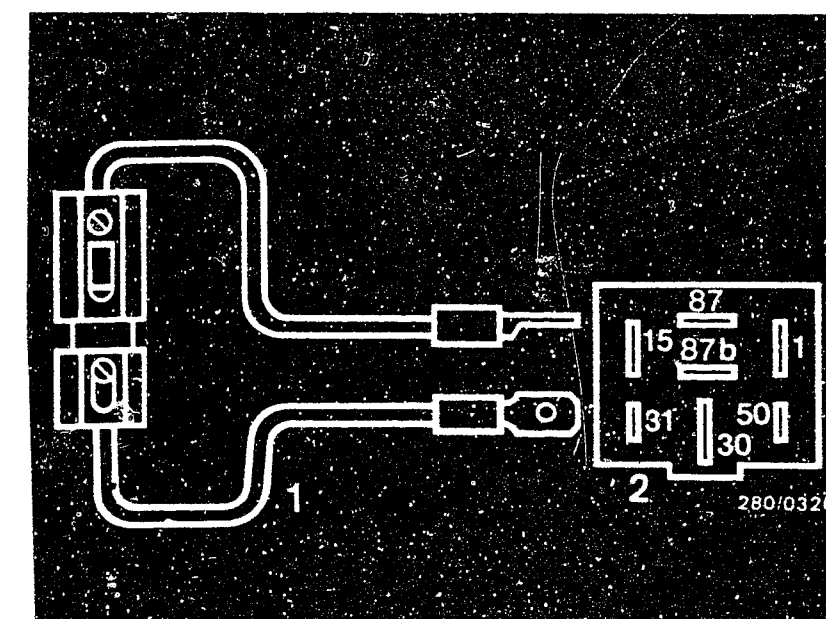
yes

Continued on E3/E4



Arrow = start valve
(blue plug)

Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base



E1

Engine starts but then dies
BMW 5, 6 and 7 series



E2

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

Auxiliary-air device tested?
(mechanically O.K.?)

no

Testing:

1. Visual examination of auxiliary-air device:
Remove hoses and look down, using a small mirror if necessary. When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

yes

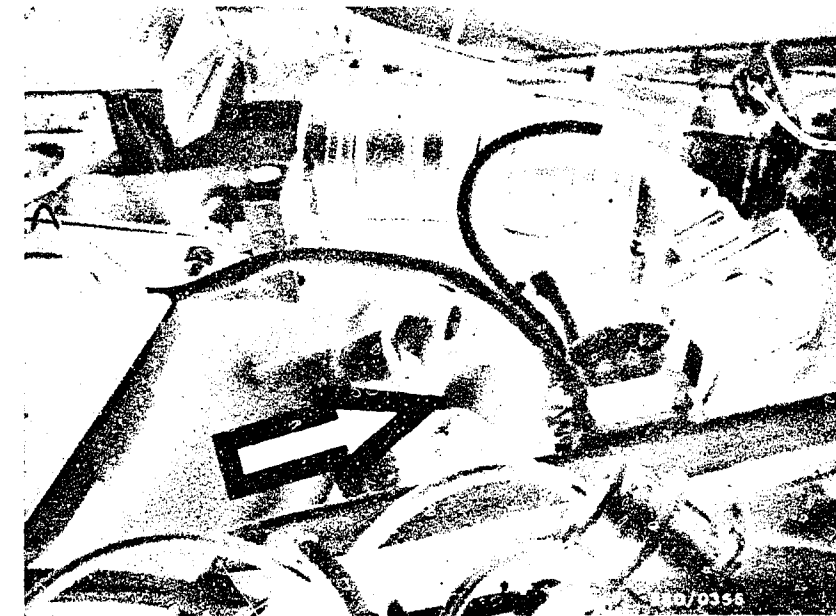
Auxiliary-air device tested?
(continued)
Electrically O.K.?

no

Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of auxiliary-air device:
Test specification: 40...75 Ω .
If the reading is outside tolerance, replace auxiliary-air device.

yes

Continued on E5/E6



Arrow=auxiliary-air device

E3

Engine starts but then dies
BMW 5, 6 and 7 series



E4

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

Are all hose lines and electric leads securely attached? visual examination.
Is the air-intake system leak-tight?

no

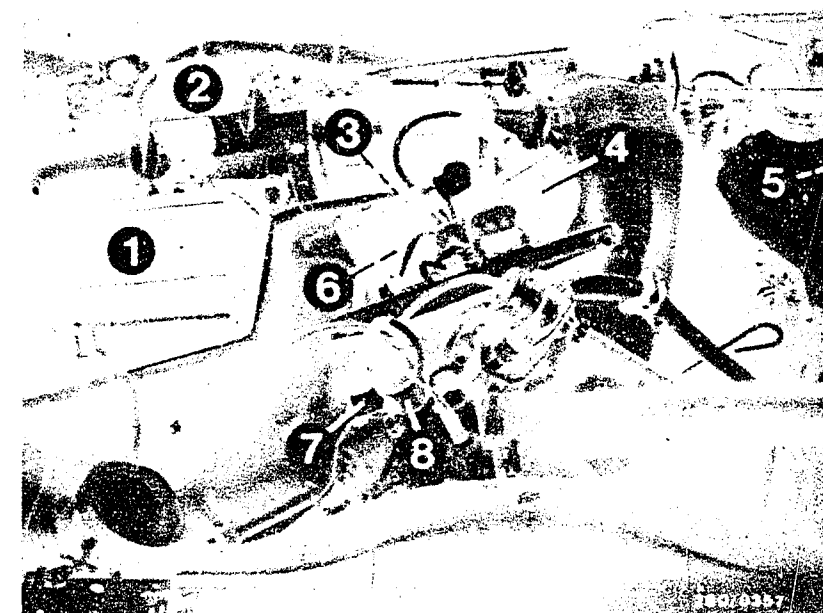
Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Checking for leaks:

Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

Check electric contacts for loose connection.

yes



- 1 = Air filter
- 2 = Air-flow sensor
- 3 = Start valve
- 4 = Throttle-valve switch
- 5 = Control relay
- 6 = Auxiliary-air device
- 7 = Temperature sensor II (white plug)
- 8 = Thermo-time switch

Continued on E7/E8

E5

Engine starts but then dies
BMW 5, 6 and 7 series



E6

Engine starts but then dies
BMW 5, 6 and 7 series



Engine starts but then dies (continued)

Testing completed for customer complaint.

"Engine starts but then dies"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B 3...B 8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

E7

Engine starts but then dies

BMW 5, 6 and 7 series



E8

Engine starts but then dies

BMW 5, 6 and 7 series



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

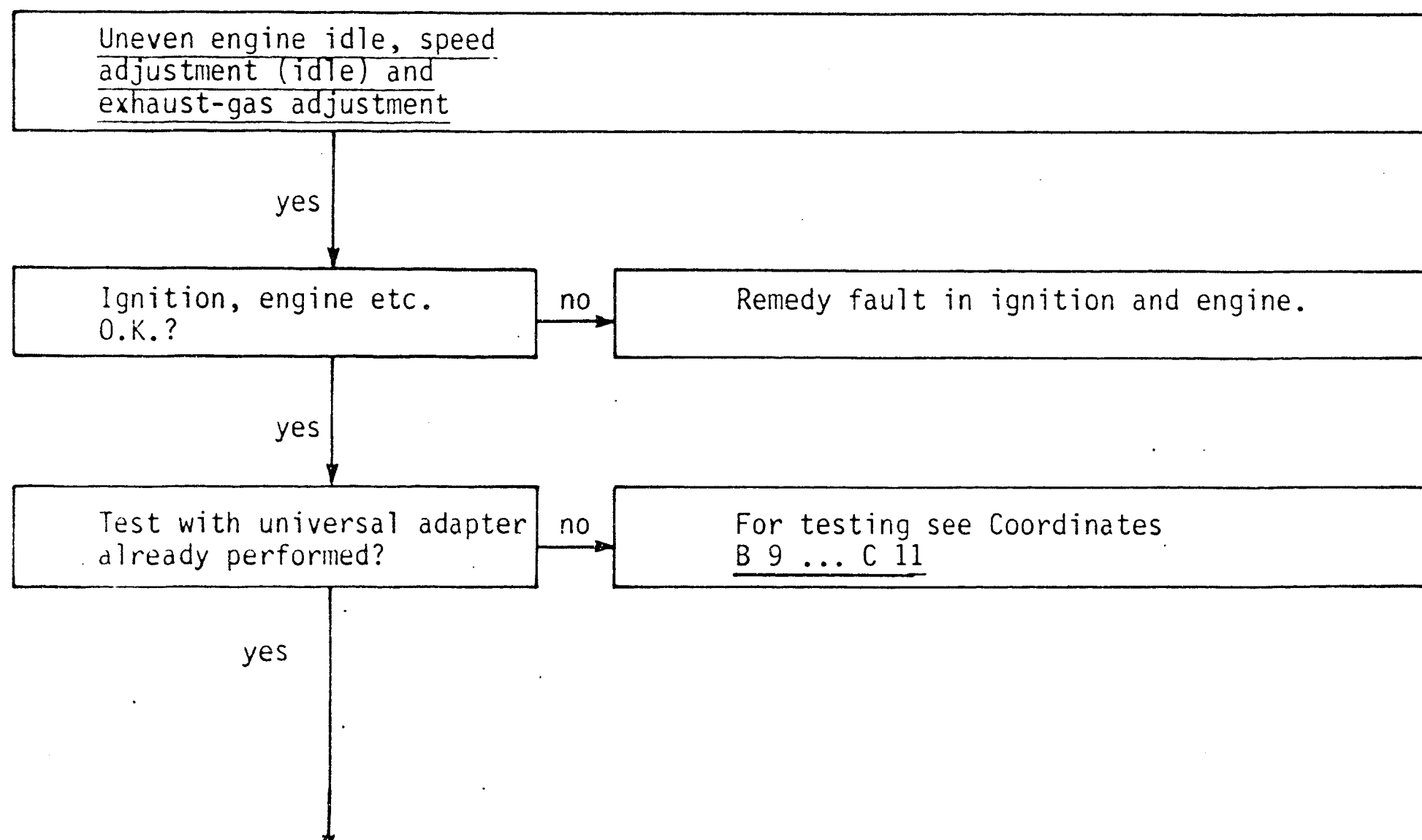
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on E11/E12

E9

Uneven engine idle
BMW 5, 6 and 7 series



E10

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas test (continued)

Throttle valve closed?

no

Testing:

Throttle valve closed?

Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.

Adjustment:

The throttle valve must be set to just before it sticks with the throttle-valve stop screw. Straighten the throttle linkage, if bent.

yes

CO and idle correctly adjusted?

no

CO and idle adjustment:

Exhaust-gas adjustment with exhaust-gas measuring instrument with engine at normal operating temperature and at idle speed

Manually-shifted transmission: $800 \dots 900 \text{ min}^{-1}$

Automatic transmission
(selector lever in addition
"P"):

$800 \dots 900 \text{ min}^{-1}$

CO setting:

max. 1.5% by vol.
CO

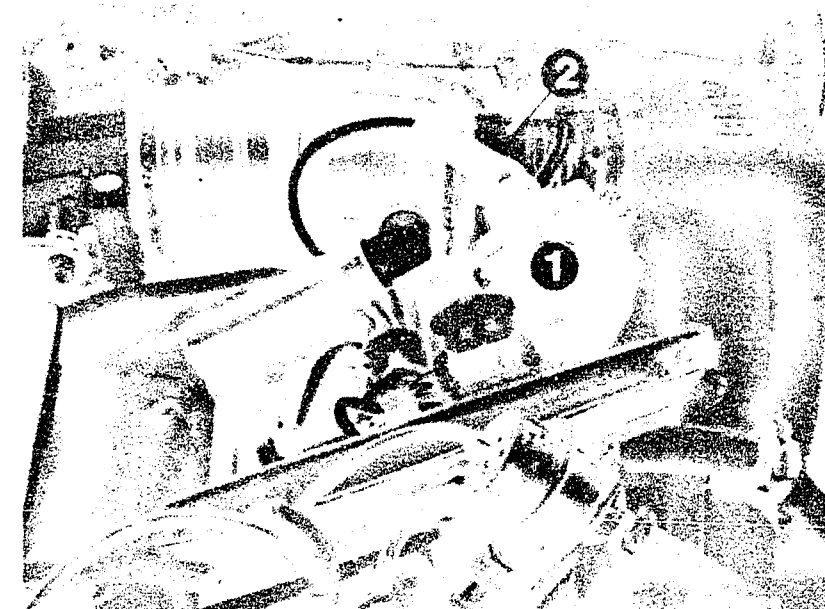
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check idle speed and CO concentration again. If necessary, carry out adjustments in several steps.

After adjusting, use new (red) plugs
(1 280 508 012).

yes

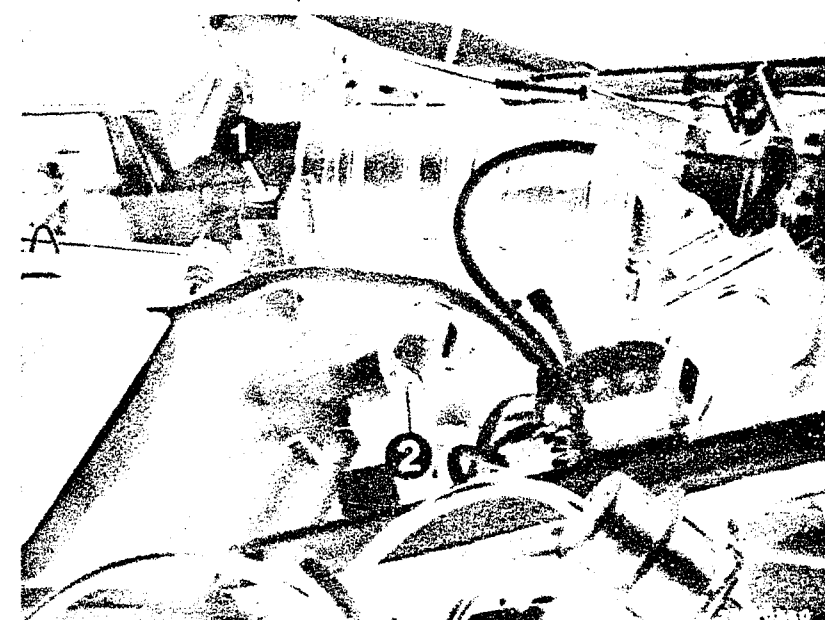
Engine speed cannot be adjusted

Continued on E13/E14



1 = Throttle-valve switch
2 = Throttle-valve assembly

1 = CO adjusting screw
2 = Idle-speed-adjusting screw



E11

Uneven engine idle
BMW 5, 6 and 7 series



E12

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas test
(continued)

Auxiliary-air device tested?
(mechanically OK?)

no

Testing:

1. Visual examination of auxiliary-air device:
When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device. Remove hoses and look down, using a small mirror if necessary.
2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop.
With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

yes

Auxiliary-air device tested?
Electrically OK?

no

Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of auxiliary-air device: test specification 40...75Ω.
If the reading is outside tolerance, replace the auxiliary-air device.

yes

Continued on E15/E16



Arrow = Auxiliary-air device

E13

Uneven engine idle
BMW 5, 6 and 7 series



E14

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas test (continued)

Solenoid-operated injection valve mechanically OK?

no

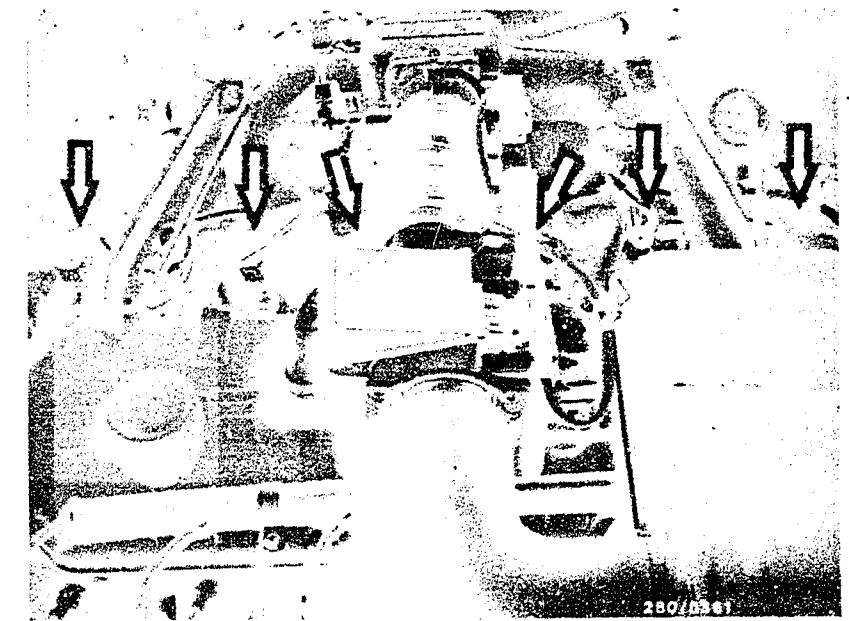
With the engine running, disconnect the injection valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve is OK. Using ohmmeter, test for continuity in the connecting leads from control relay term. 87 to the individual injection valves and from the injection valves to the multiple plug term. 12 and term. 24. Set value approx. 0Ω . Resistance of the individual injection valves $15\Omega...20\Omega$.

Caution: When replacing the injection valves, install only solenoid-operated injection valve
0 280 150 203

If the O-rings or the protective sleeve are defective, but the electronic fuel-injection valves are functioning properly, then use parts set 1 287 010 704. Push on the supporting washer, pull on both O-rings and carefully press on a new protective sleeve with a section of pipe which you must make yourself (approx. 120 mm long and with an inner diameter of 10 mm). Do not damage the injection valve needle. If the O-ring (fuel distributor connection) has swollen up, it must also be exchanged.

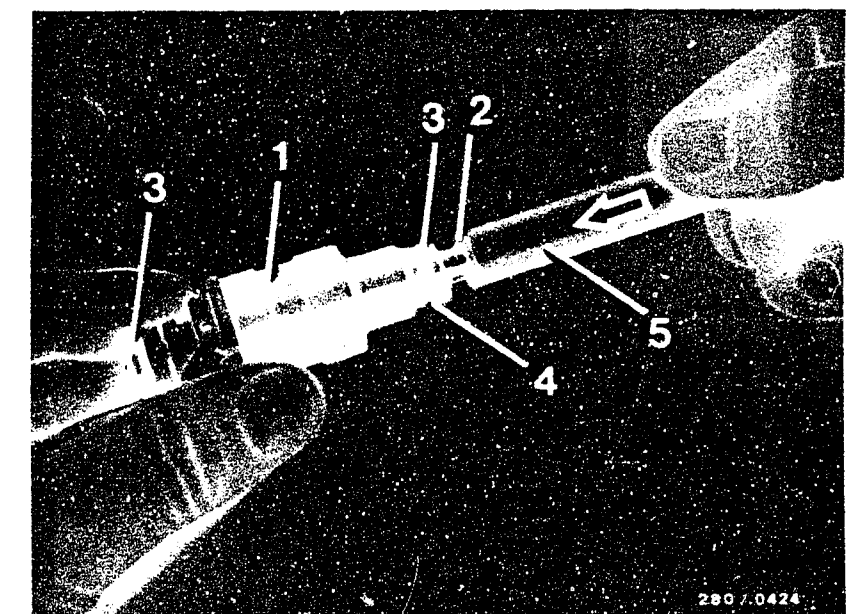
yes

Continued on E17/E18



Arrows = Solenoid-operated injection valves

- 1 = Fuel-injection valve
- 2 = New protective sleeve
- 3 = O-ring
- 4 = Supporting washer
- 5 = Pipe section



E15

Uneven engine idle
BMW 5, 6 and 7 series



E16

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas test (continued)

Start valve OK?

no

Functional test: Check the power supply to the start valve when starting. To do this, remove the plug from the start valve and connect voltmeter to term. 30 and term. 29/term 4 of the start valve plug.

1. Coolant temperature at ambient temperature (+15°C...30°C): Voltage reading min. 6 V.

2. Coolant temperature at operating temperature (approx. +80°C): Voltage reading approx. 0 V.

Test the following leads for continuity using ohmmeter. Set value: approx. 0 Ω. Lead from term. 30 to thermo-time switch term. W. Lead from term. 29 to thermo-time switch term. G.

Lead from term. 4 to control relay term. 50. Check ground connection of thermo-time switch.

Electrical test of start valve:

Connect ohmmeter to start valve term. 29 and term. 30: Set value approx. 4 Ω.

Mechanical test of start valve:

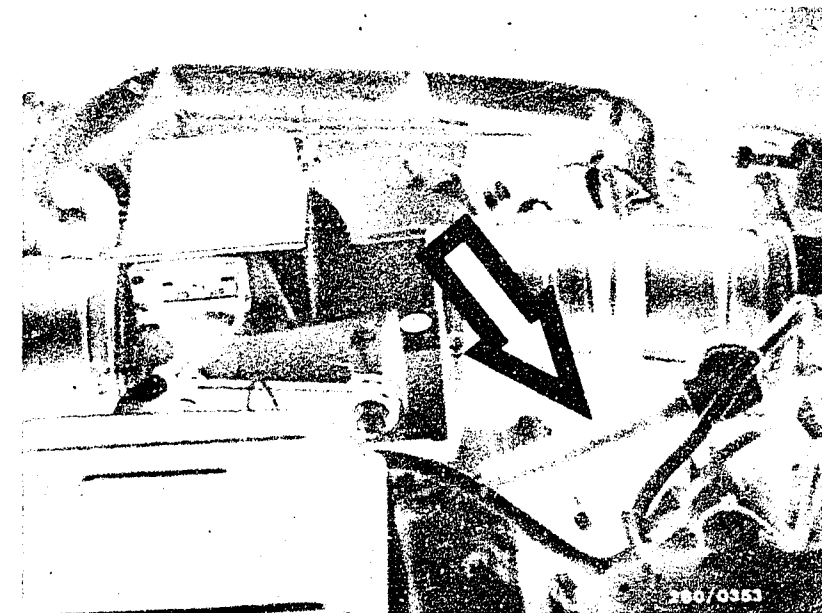
Remove start valve from the intake manifold and hold in a container. (Caution! fire hazard!)

When starting and at ambient temperature (+15°C.. 30°C) the start valve must squirt (max. 8 sec.).

At operating temperature (+80°C) the start valve must not squirt. With the ignition switched on and the pressure built up, the start valve must likewise not squirt.

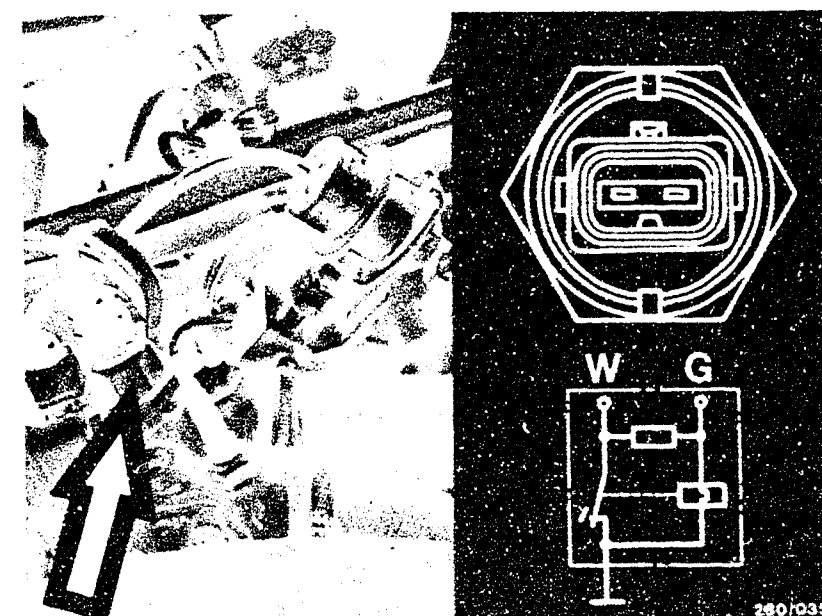
yes

Continued on E19/E20



Arrow = Start valve
(blue plug)

Arrow = Thermo-time switch



E17

Uneven engine idle
BMW 5, 6 and 7 series



E18

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Start valve O.K.?
(continued)

no

Carry out squirt test at operating temperature (+80°C) as follows: Remove plug from thermo-time switch and ground term. W.

Testing the start valve for leaks

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).

Caution!

The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes

Thermo-time switch O.K.?

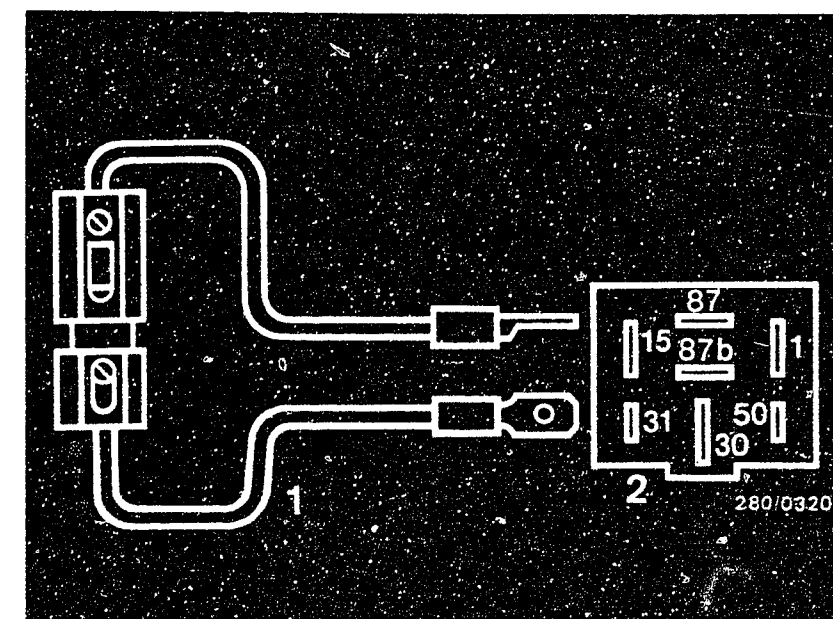
no

Electrical test:

Test the thermo-time switch 35°C/8 sec. as follows: Remove the plug and measure resistance directly at thermo-time switch with ohmmeter.

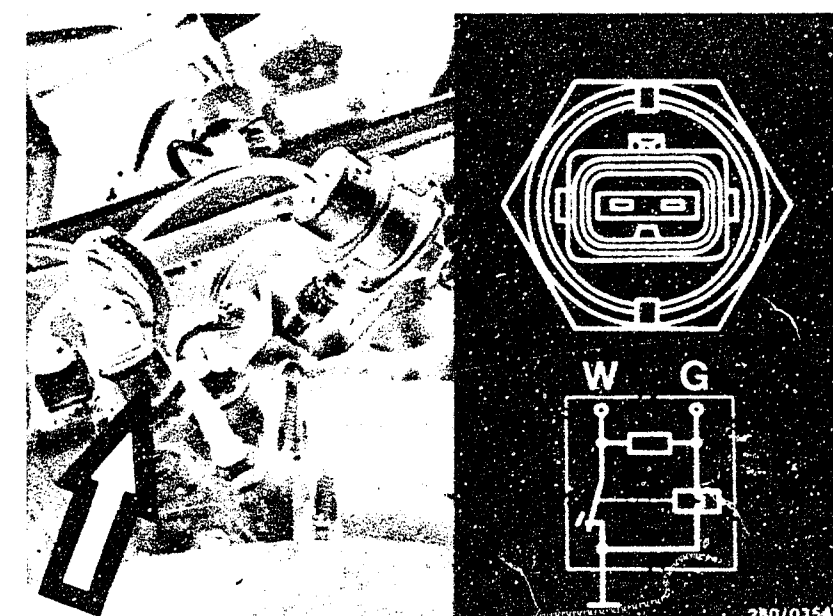
yes

Continued on E21/E22



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base

Arrow = Thermo-time switch



E19

Uneven engine idle
BMW 5, 6 and 7 series



E20

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment
(continued)

Thermo-time switch OK?
(continued)

no

1. Between term. "G" and ground at ambient temperature (below +30°C): 25...40 Ω
at operating temperature (above +40°C): 50...80 Ω
2. Between term. "W" and ground at ambient temperature (below +30°C): 0 Ω
at operating temperature (above +40°C): 100..160 Ω
3. Between term. "G" and "W" at ambient temperature (below +30°C): 25...40 Ω
at operating temperature (above +40°C): 50...80 Ω

yes

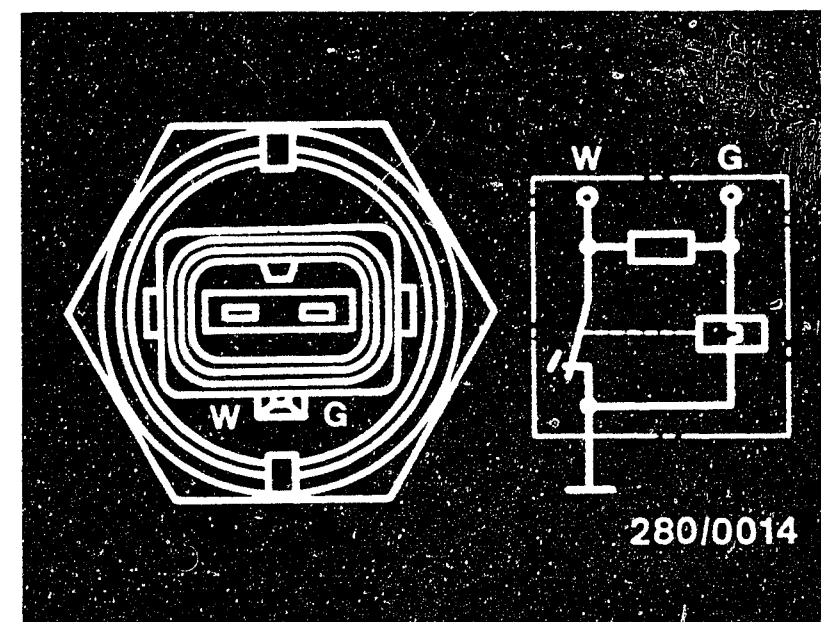
Fuel pressure OK?
Test specification: 2.8...3.2 bar
Test specification reached?

no

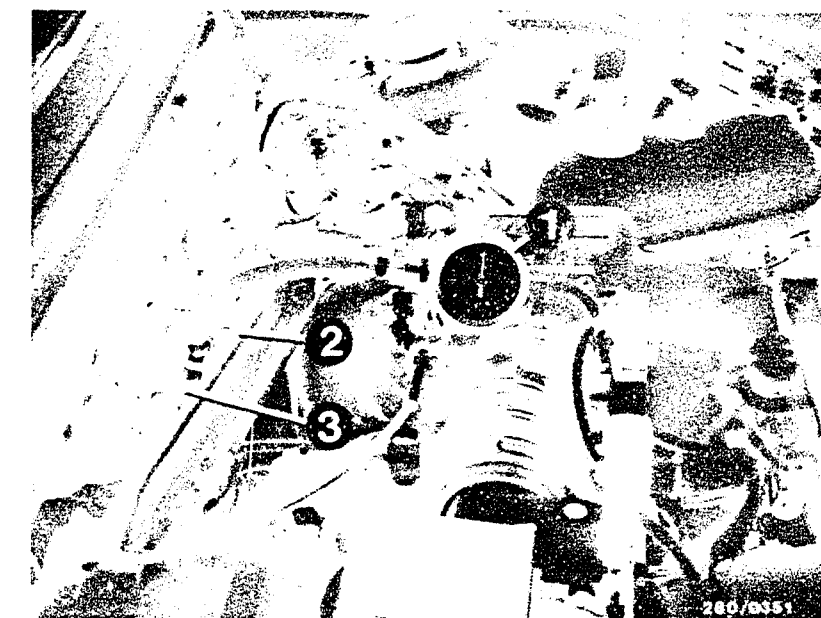
Testing the fuel pressure
Remove hose from the fuel delivery line (connection on fuel-distribution pipe). Connect pressure gauge.
Caution!
When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

yes

Continued on E23/E24



- 1 = Pressure gauge (pressure tester 1 687 231 154)
- 2 = Fuel delivery line
- 3 = Fuel distribution pipe



E21

Uneven engine idle
BMW 5, 6 and 7 series



E22

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas test
(continued)

Fuel pressure OK?

Test specification: 2.8...3.2
bar

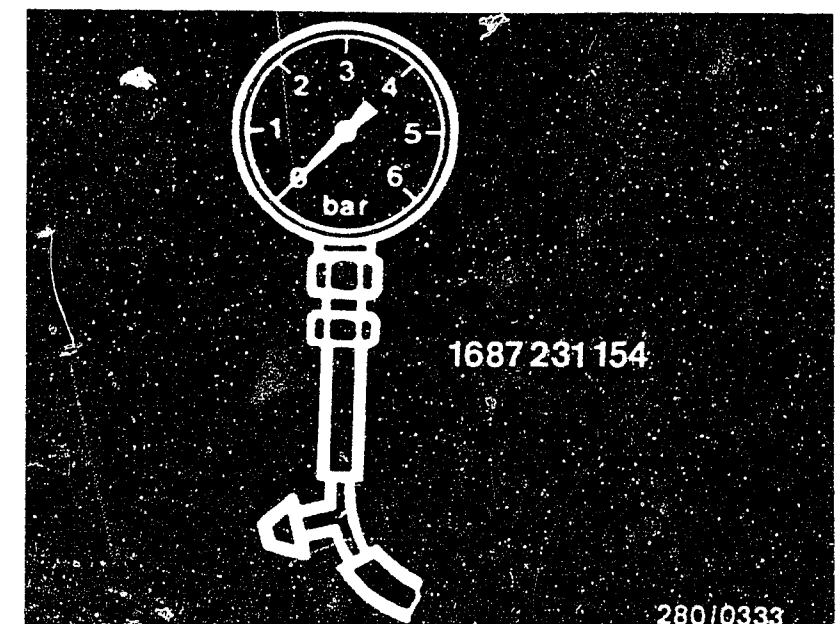
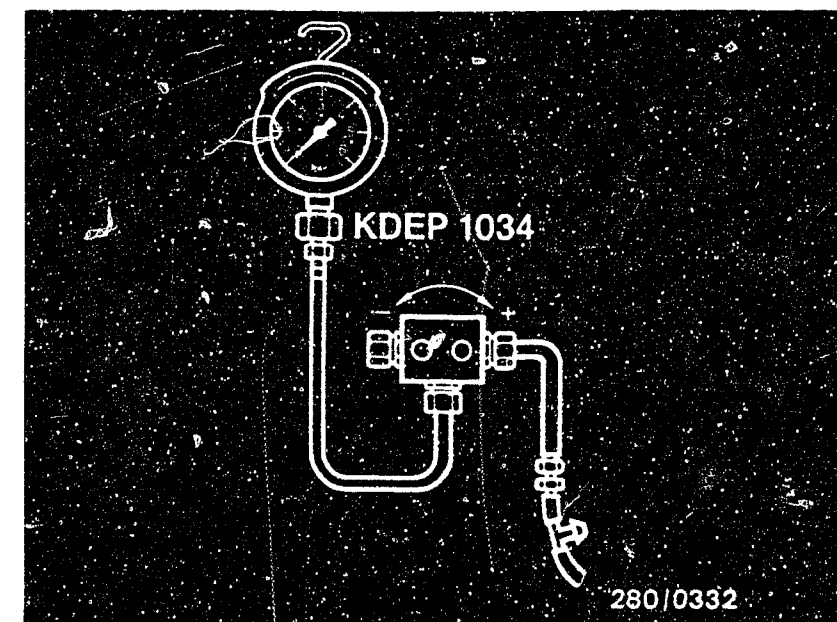
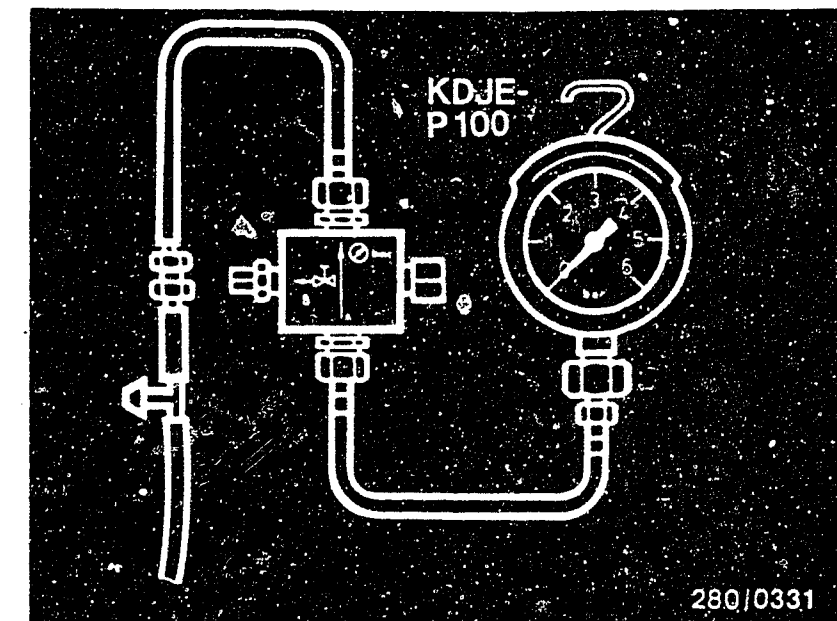
Test specification reached?

no

Connect the connections of the pressure testers into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic. The end of the hose is plugged onto the fuel-distribution pipe, and the free Y-piece is plugged onto the fuel delivery hose to the fuel-distribution pipe. Make sure there are no leaks.

yes

Continued on F1/F2



E23

Uneven engine idle
BMW 5, 6 and 7 series



E24

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas test (continued)

Fuel pressure OK?
Test specification: 2.8...3.2 bar
Pressure regulator OK? Test specification reached?

no

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30. Fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Caution!

Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2.5 bar.

Testing the pressure regulator

Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30. Electric fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Fuel pressure of 2.8 bar not reached:

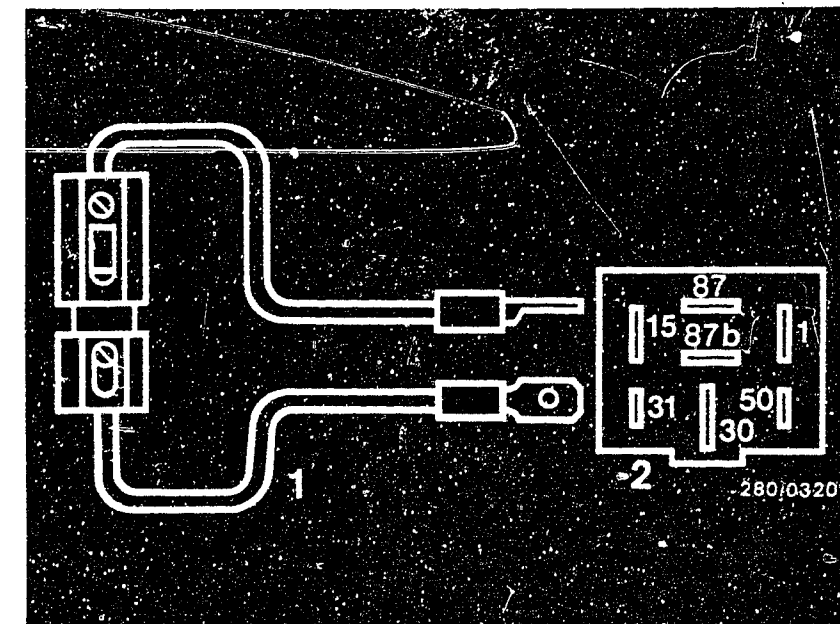
1. Slowly pinch off fuel return line: (Caution: do not load pressure gauge above 6 bar.)

Pressure rises above 4 bar → replace pressure regulator.

Pressure remains below 4 bar → replace fuel pump.

yes

Continued on F3/F4



Jumper (user-fabricated)

1 = Fuel holder with a 10 A fuse

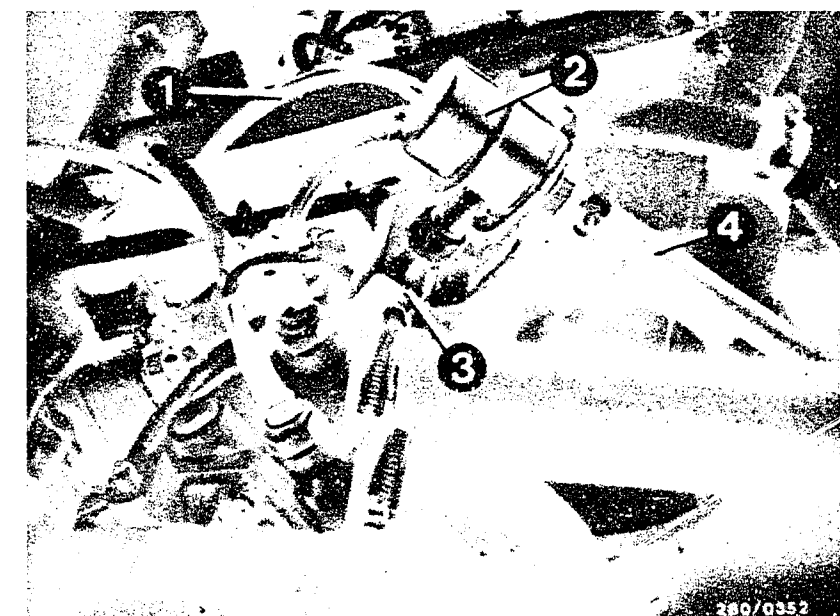
2 = Top view of connection base

1 = Intake-manifold connection

2 = Pressure regulator

3 = Fuel delivery line

4 = Fuel return line



F1

Uneven engine idle

BMW 5, 6 and 7 series



F2

Uneven engine idle

BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment
(continued)

Fuel pressure OK?
Test specification: 2.8...3.2
bar
Pressure regulator OK?
Test specification reached?

no

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 3.2 bar exceeded:

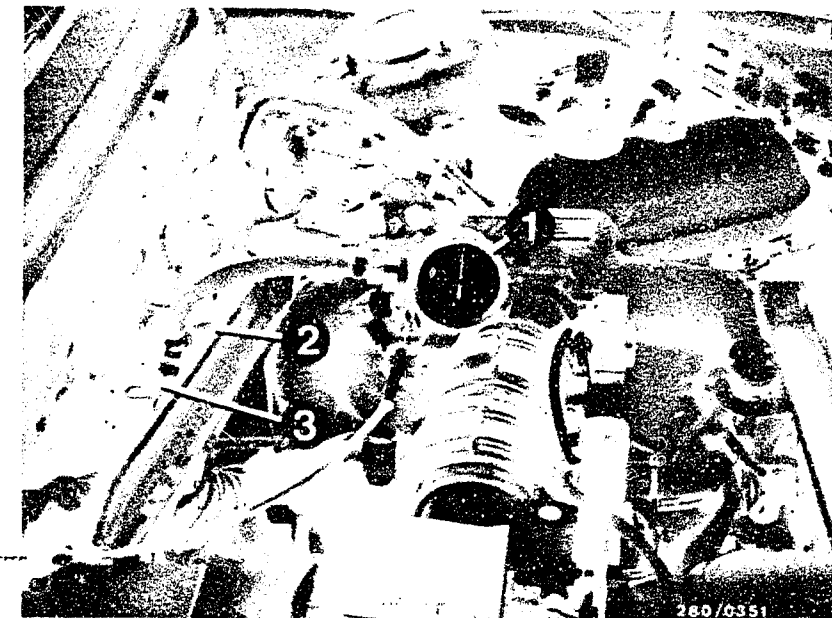
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!

Jumper must be removed again after test is completed, and the control relay must be fitted in position.

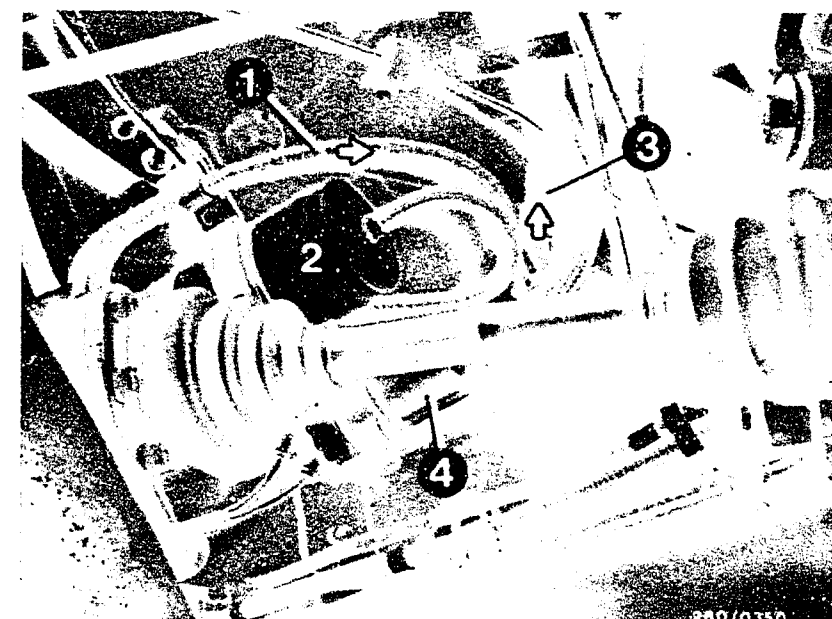
yes

Continued on F5/F6



- 1 = Pressure gauge (pressure tester
1 687 231 154)
2 = Fuel delivery line
3 = To fuel-distribution pipe

- 1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump



F3

Uneven engine idle
BMW 5, 6 and 7 series



F4

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas test
(continued)

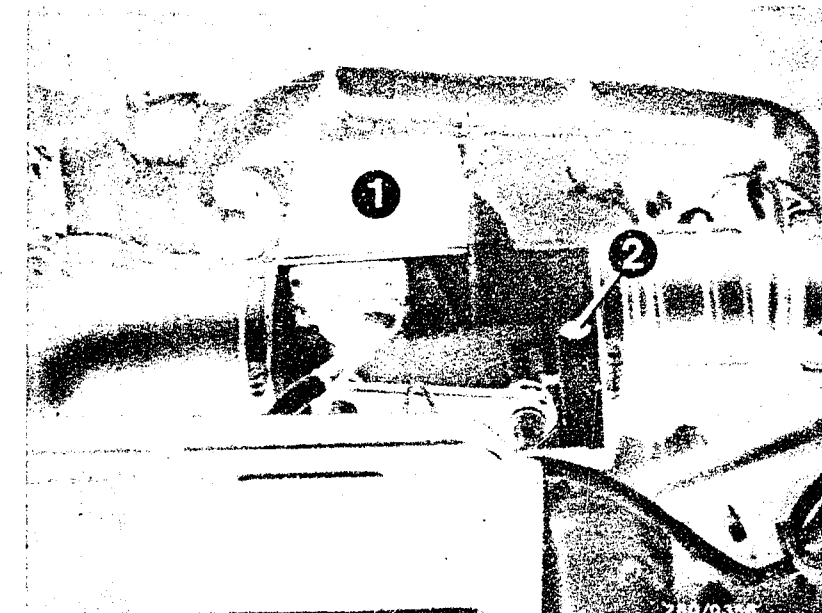
Air-flow sensor OK?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: $160...300\ \Omega$. Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: $60...1000\ \Omega$. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes

Continued on F7/F8



1 = Air-flow sensor
2 = CO adjusting screw

F5

Uneven engine idle
BMW 5, 6 and 7 series



F6

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

no

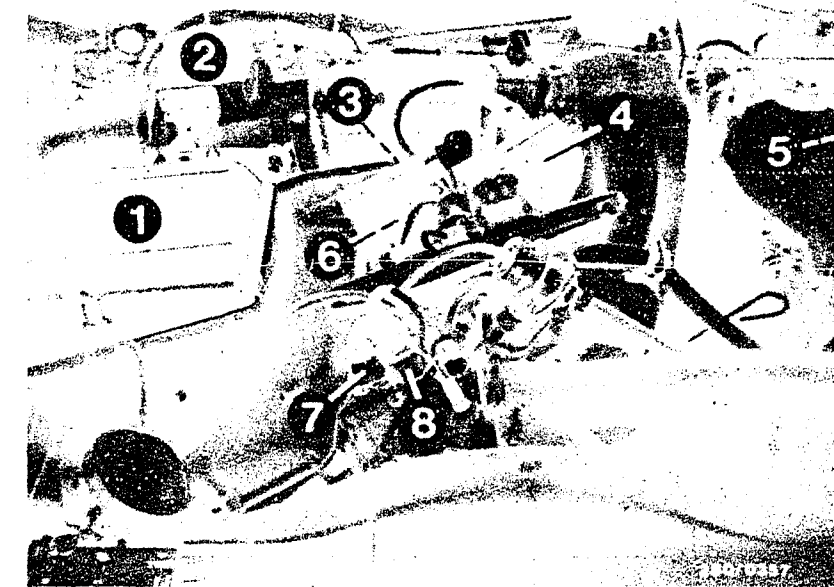
Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Checking for leaks:

Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

Check electric contacts for loose connection.

yes



- 1 = Air filter
- 2 = Air-flow sensor
- 3 = Start valve
- 4 = Throttle-valve switch
- 5 = Control relay
- 6 = Auxiliary-air device
- 7 = Temperature sensor II (white plug)
- 8 = Thermo-time switch

Continued on F9/F10

F7

Uneven engine idle
BMW 5, 6 and 7 series



F8

Uneven engine idle
BMW 5, 6 and 7 series



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment
(continued)

CO and idle speed correctly adjusted?
Repeat

no

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.
Idle speed

Manually-shifted transmission: 800...900 min⁻¹

Automatic transmission
(selector lever in position
"P")

800...900 min⁻¹

CO setting: max.1.5% by vol.CO

If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration again. Carry out adjustments in several steps. After adjusting, use new plugs.

yes

Testing completed for customer complaint

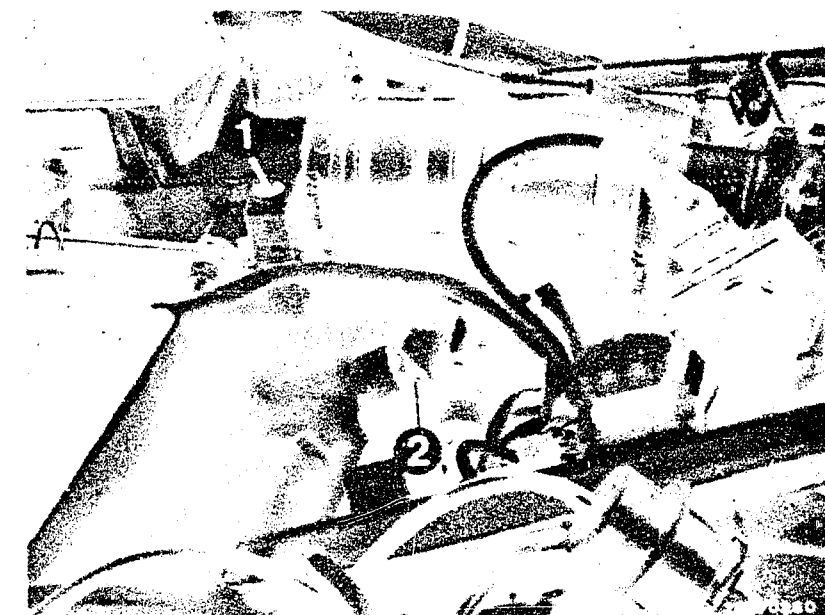
"Uneven engine idle"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically OK (Compression, valve setting, valve timing, worn camshaft).



1 = CO adjusting screw

2 = Idle-speed-adjusting screw

F9

Uneven engine idle

BMW 5, 6 and 7 series



F10

Uneven engine idle

BMW 5, 6 and 7 series



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

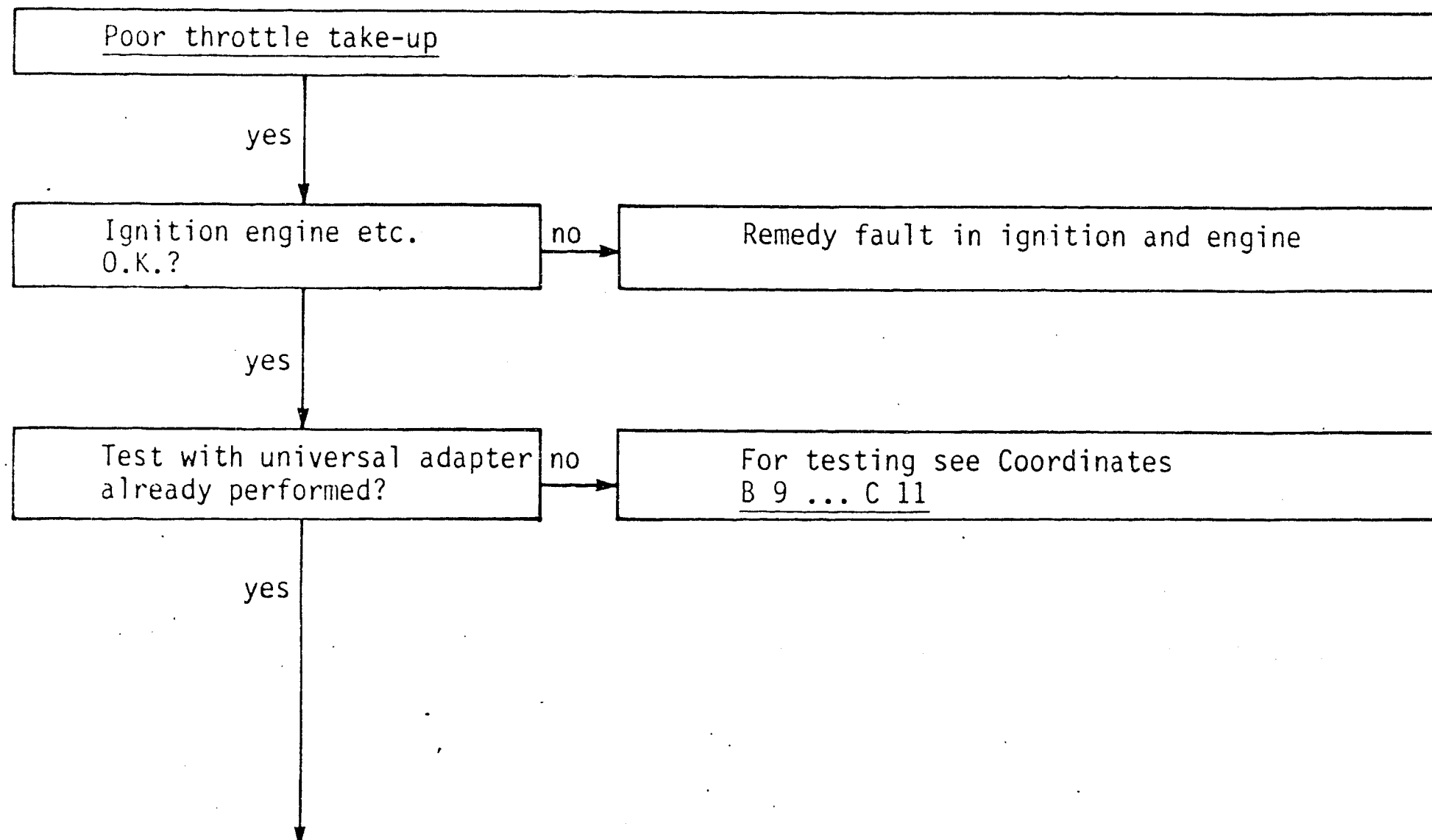
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on F13/F14

F11

Poor throttle take-up
BMW 5, 6 and 7 series



F12

Poor throttle take-up
BMW 5, 6 and 7 series



Poor throttle take-up (continued)

Throttle valve closed?

no

Testing:

Throttle valve closed?

Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.

Adjustment:

The throttle valve must be set to just before it sticks with the throttle-valve stop screw. Straighten the throttle linkage, if bent.

yes

Auxiliary-air device tested?
(Mechanically OK?)

no

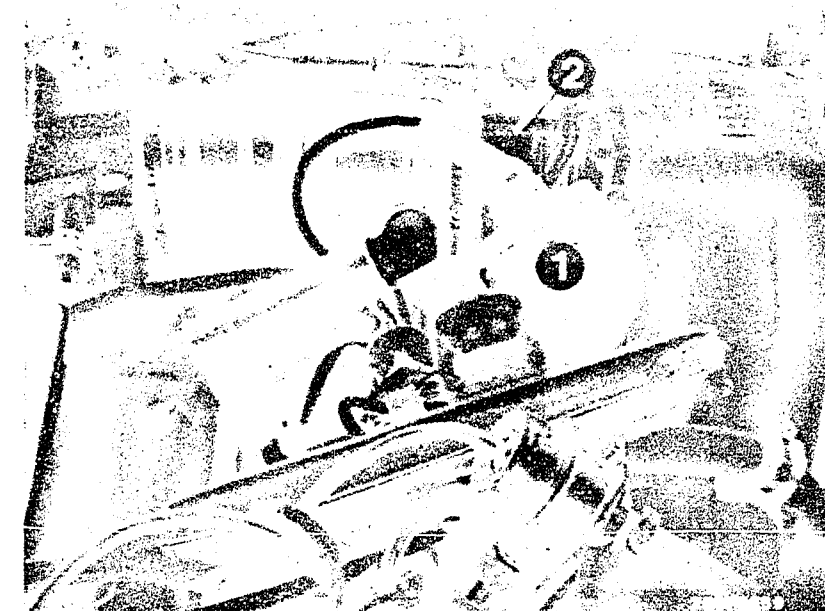
Testing:

1. Visual examination of auxiliary-air device:

When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device. (Remove hoses and look down, using a small mirror if necessary).

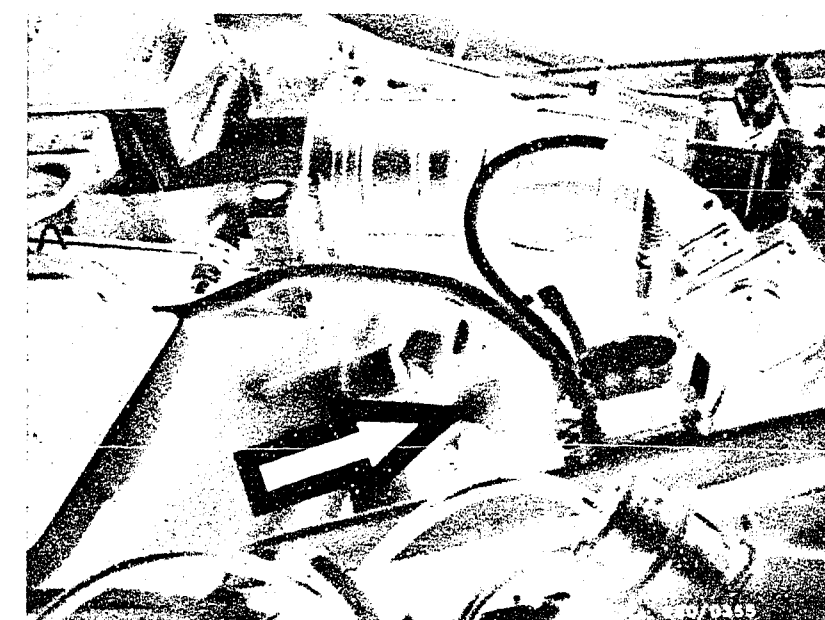
yes

Continued on F15/F16



1 = Throttle-valve switch
2 = Throttle-valve assembly

Arrow = Auxiliary-air device



F13

Poor throttle take-up
BMW 5, 6 and 7 series



F14

Poor throttle take-up
BMW 5, 6 and 7 series



Poor throttle take-up (continued)

Auxiliary-air device tested?
(continued)
Electrically OK?

no

2. Functional test of auxiliary-air device: With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).
Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of auxiliary-air device: Test specification: 40...75 Ω.

If the reading is outside tolerance, replace the auxiliary-air device.

yes

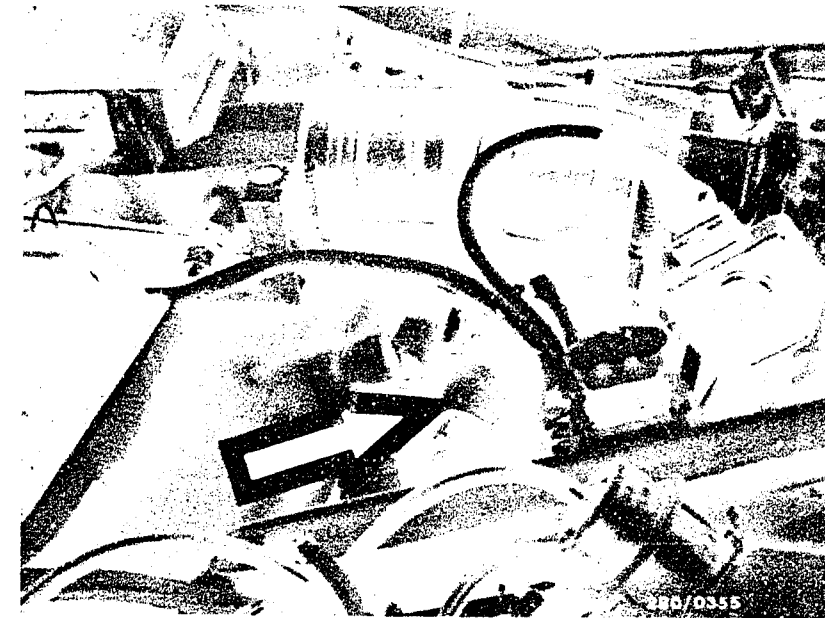
Air-flow sensor OK?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

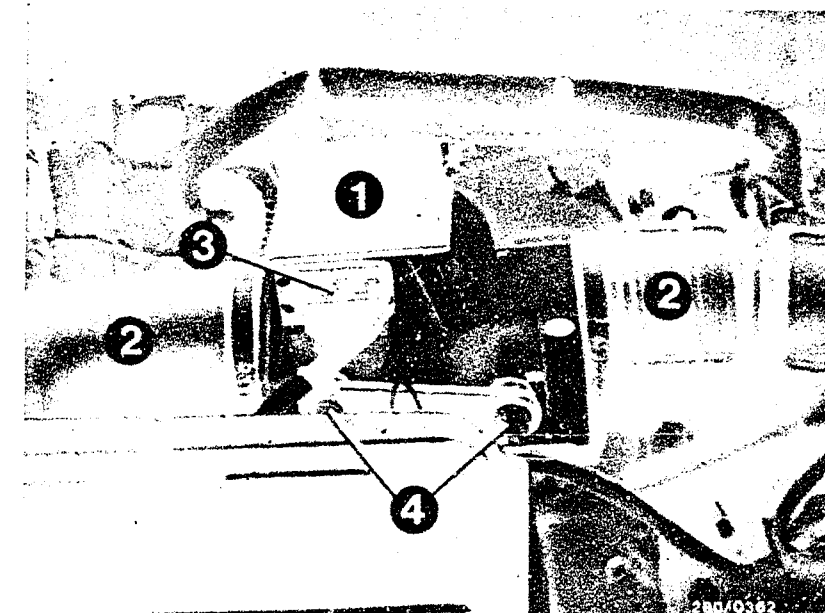
yes

Continued on F17/F18



Arrow = Auxiliary-air device

- 1 = Air-flow sensor
- 2 = Air-guide hoses
- 3 = Plug
- 4 = Fastening screws



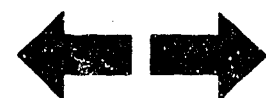
F15

Poor throttle take-up
BMW 5, 6 and 7 series



F16

Poor throttle take-up
BMW 5, 6 and 7 series



Poor throttle take-up (continued)

Air-flow sensor OK?
(continued)

no

Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: $160...300\ \Omega$. Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: $60...1000\ \Omega$. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

If engine missing: (noise test)

Remove air-flow sensor. Remove both hoses to the air-flow sensor. Loosen fastening screw. Leave the plug on. Set motortester to "special input" and connect using special cable to air-flow sensor term. 7 (red clip) and term. 5 (black clip). Set control stick for image adjustment on motortester as far as it will go to the left (calibrated setting).

Remove the control relay. Fit a jumper in the connection base between term. 87 and term. 30.

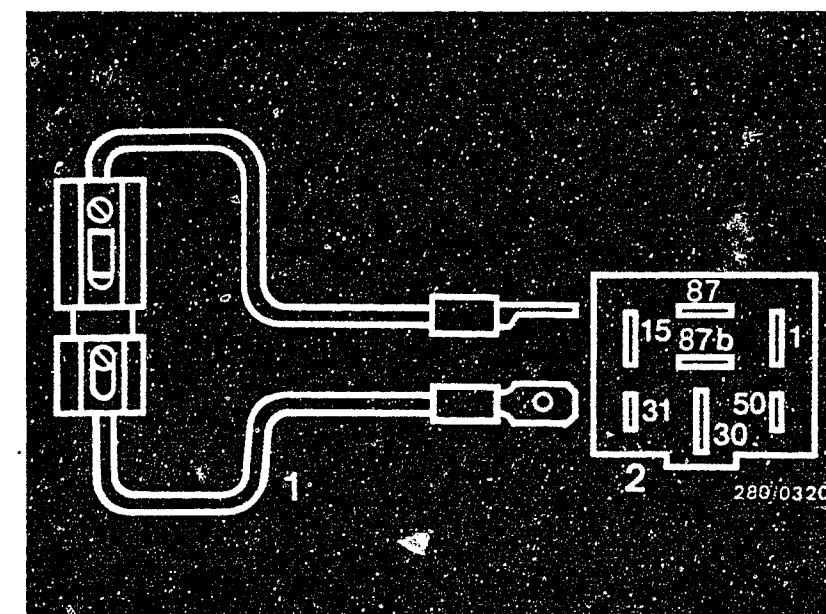
Power supply to the control unit.

Deflect air-flow sensor flap suddenly several times. The oscilloscope must show a continuous signal. If incorrect (see illustration) → replace air-flow sensor.

Caution! Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes

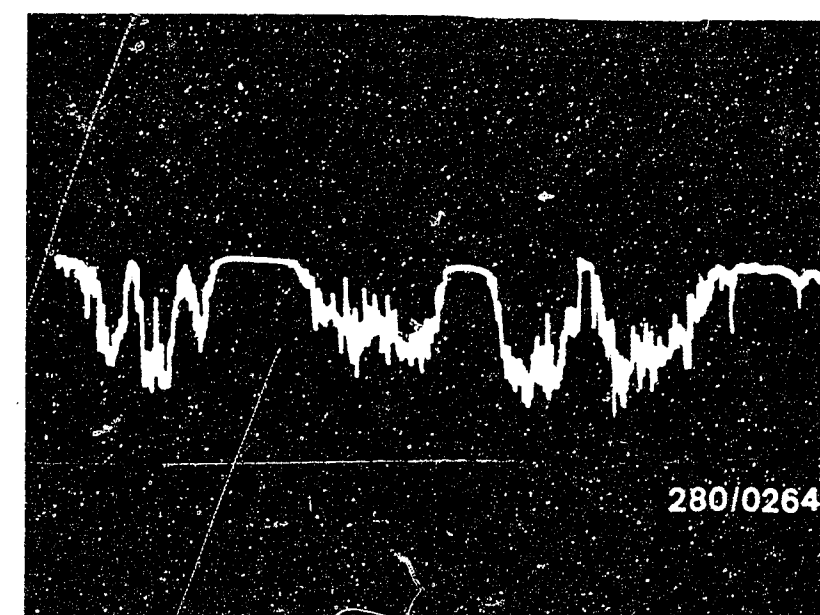
Continued on F19/F20



Jumper (user-fabricated)

1 = Fuse holder with 10 A fuse

2 = Top view of connection base



F17

Poor throttle take-up
BMW 5, 6 and 7 series



F18

Poor throttle take-up
BMW 5, 6 and 7 series



Poor throttle take-up (continued)

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

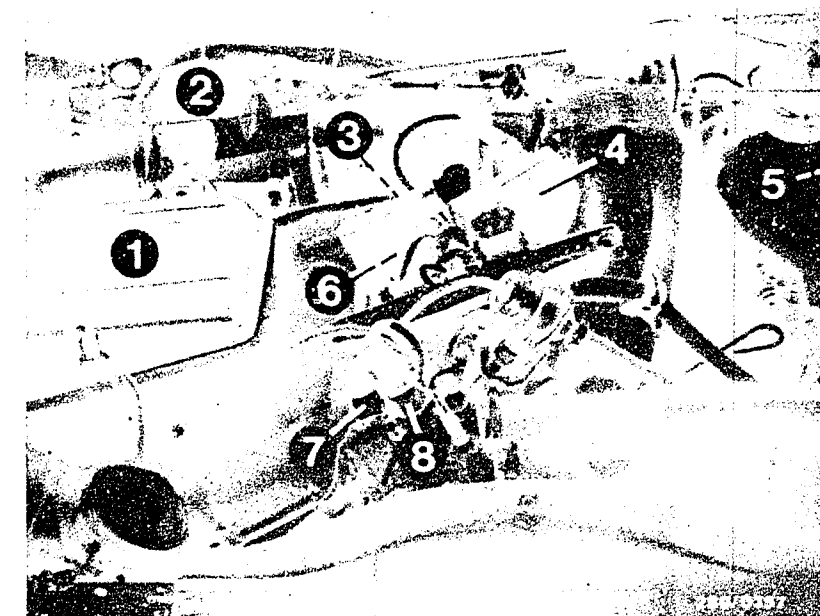
Checking for leaks:

Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

Check electric contacts for loose connection.

yes

Continued on F21/F22



- 1 = Air filter
- 2 = Air-flow sensor
- 3 = Start valve
- 4 = Throttle-valve switch
- 5 = Control relay
- 6 = Auxiliary-air device
- 7 = Temperature sensor II (white plug)
- 8 = Thermo-time switch

F19

Poor throttle take-up
BMW 5, 6 and 7 series



F20

Poor throttle take-up
BMW 5, 6 and 7 series



Poor throttle take-up (continued)

CO and idle correctly adjusted?

no

yes

Engine speed cannot be adjusted.

yes

Testing completed for customer complaint

"Poor throttle take-up"

Customer complaint remedied?

no

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.
Idle speed:

Manually-shifted transmission: 800...900 min⁻¹

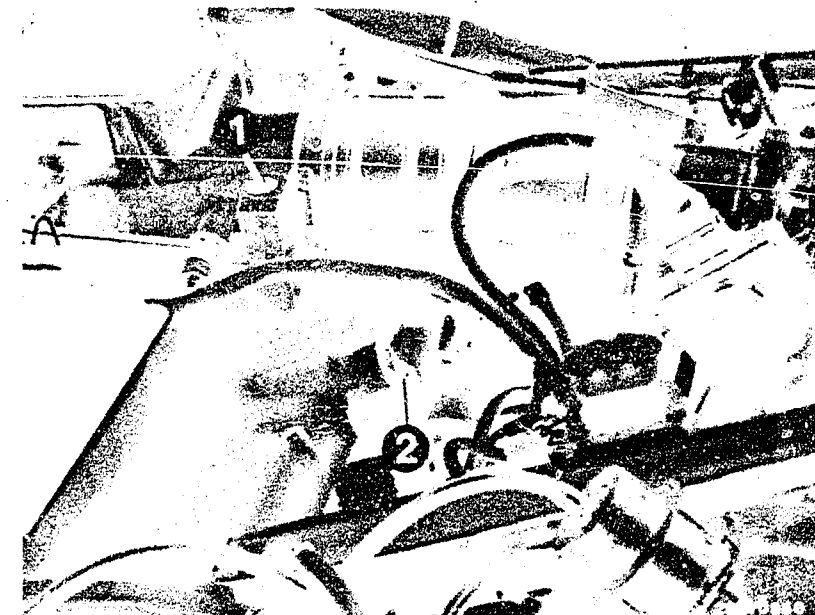
Automatic transmission
(Selector lever in position "P"):
800...900 min⁻¹

CO setting max.1.5% by vol.CO

If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check idle speed and CO concentration again. If necessary, carry out adjustments in several steps. After adjusting, use new (red) plugs (1 280 508 012).

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B 3...B 8)
If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B 3/B 4).
- Engine not mechanically OK (Compression, valve setting, valve timing, worn camshaft).



1 = CO adjusting screw
2 = Idle-speed-adjusting screw



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

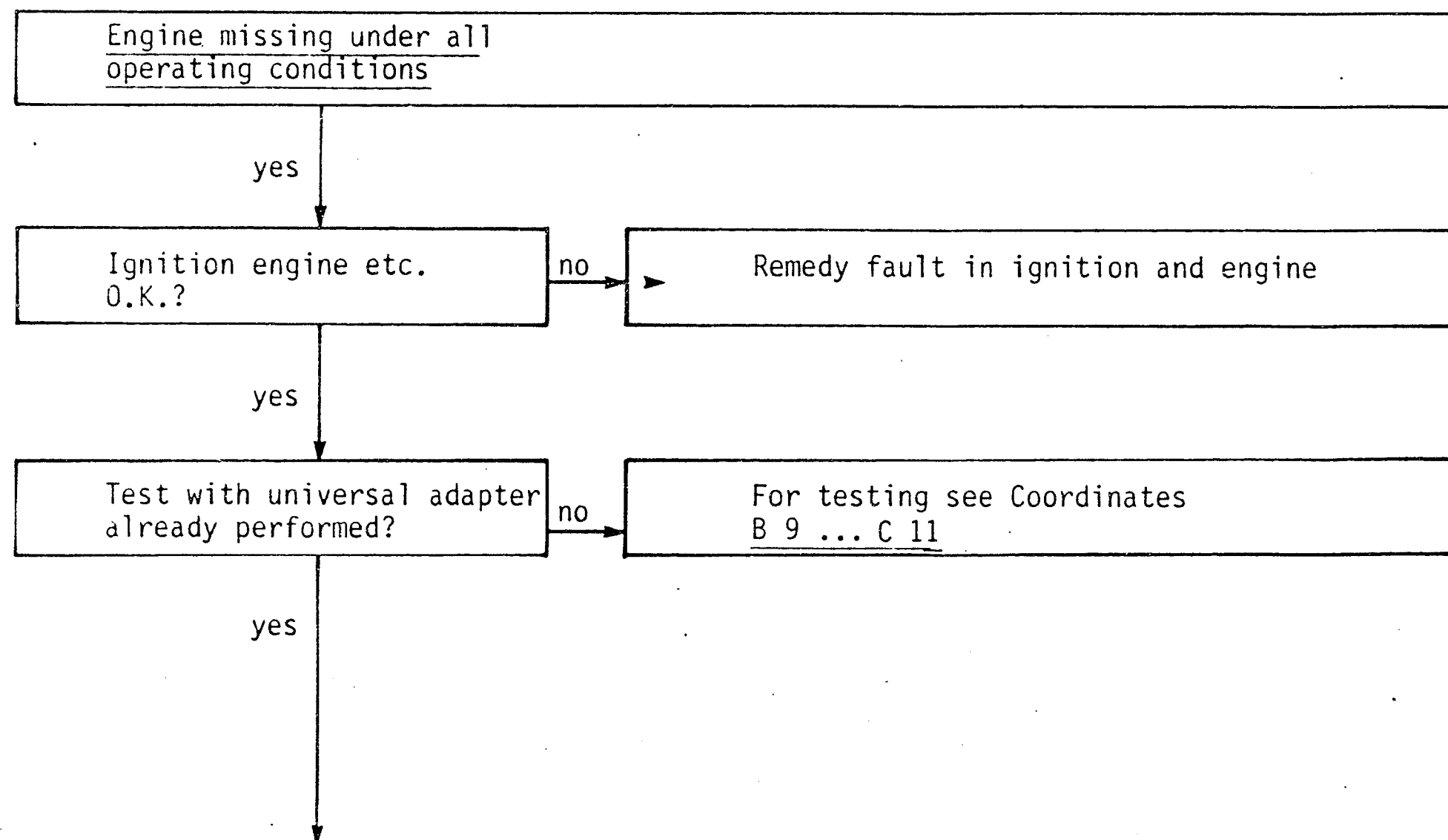
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on G3/G4

G1

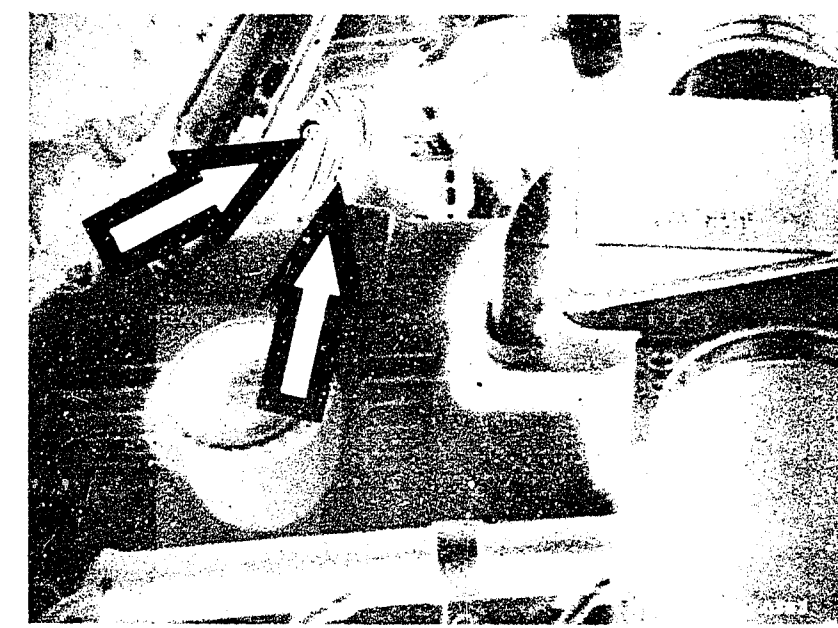
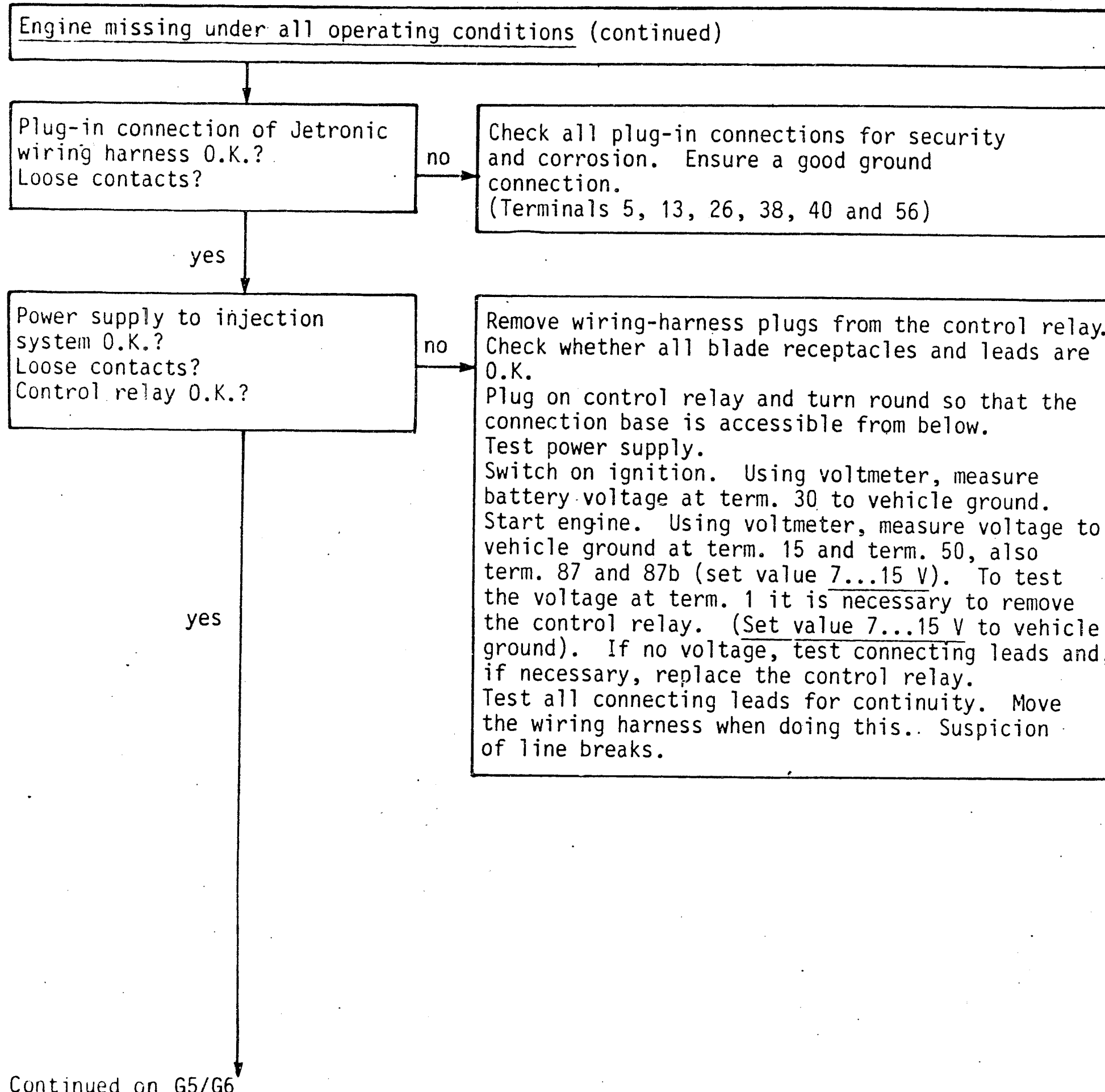
Engine missing under all op.conditions
BMW 5, 6 and 7 series



G2

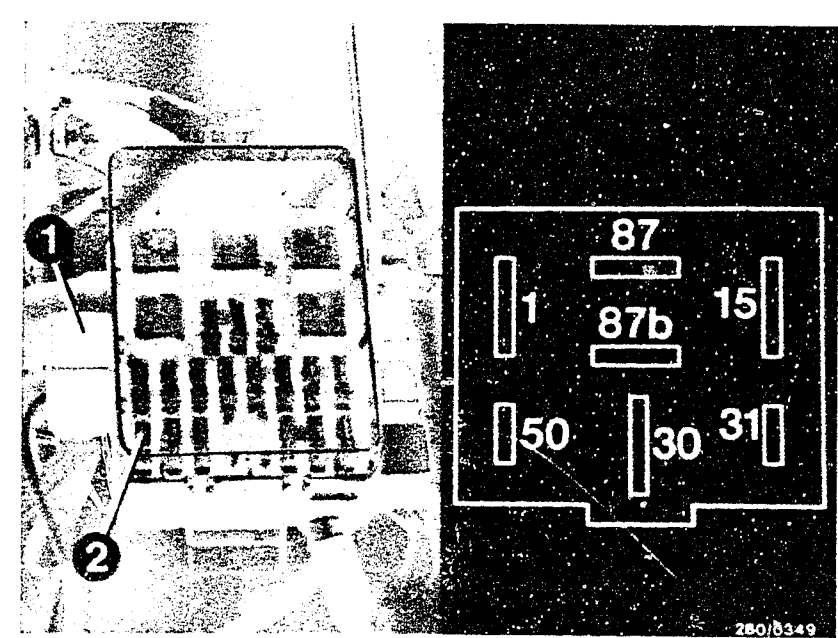
Engine missing under all op.conditions
BMW 5, 6 and 7 series

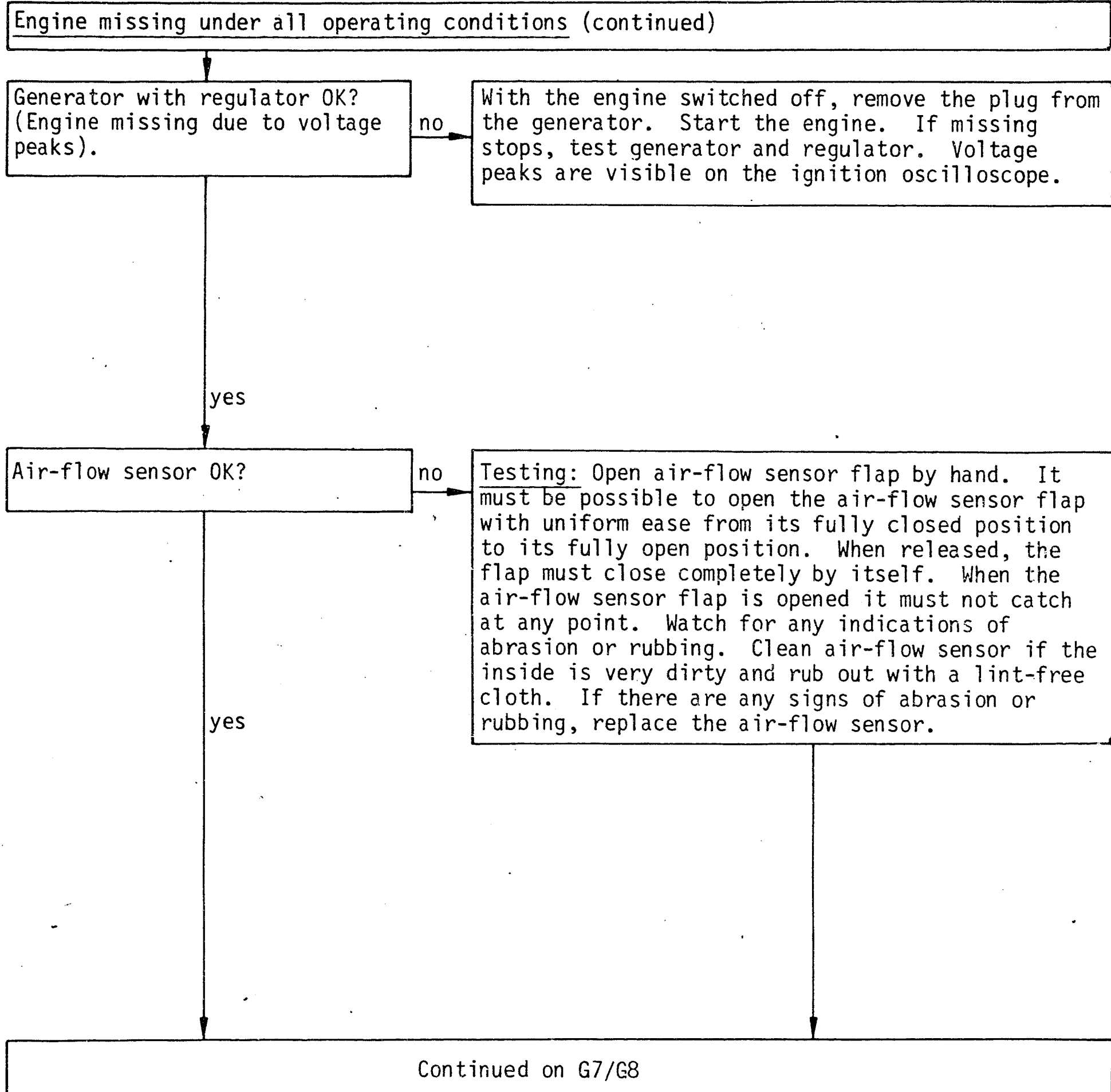




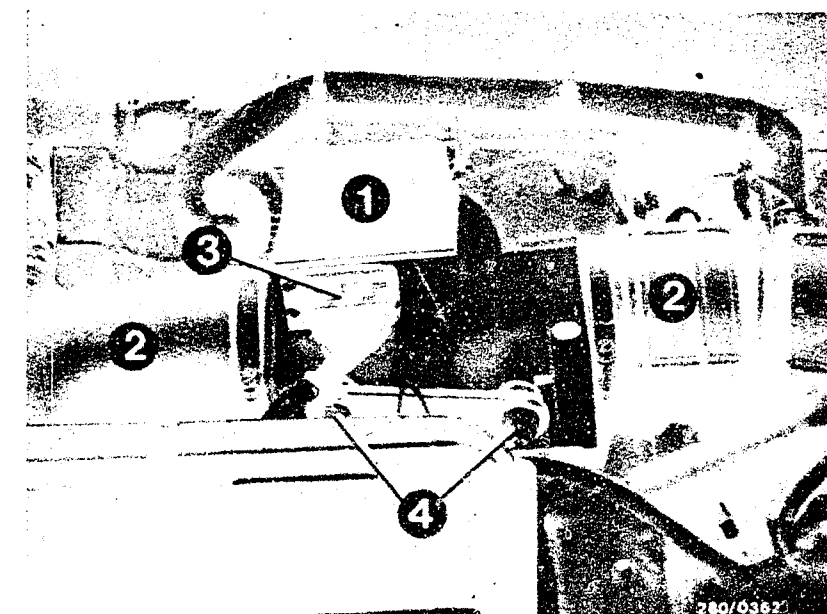
Arrow=central ground terminal

- 1 = Control relay
- 2 = Pump fuse





- 1 = Air-flow sensor
- 2 = Air-guide hoses
- 3 = Plug
- 4 = Fastening screws



G5

Engine missing
BMW 5, 6 and 7 series



G6

Engine missing
BMW 5, 6 and 7 series



Engine missing under all operating conditions (continued)

Air-flow sensor OK?

no

Connect ohmmeter to term. 8 and term 9 of air-flow sensor. Test specification: 160...300 Ω . Connect ohmmeter to term. 7 and term 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60...1000 Ω . Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

If engine missing: (noise test)

Remove air-flow sensor. Remove both hoses to the air-flow sensor. Loosen fastening screw. Leave the plug on. Set motortester to "special input" and connect using special cable to air-flow sensor term. 7 (red clip) and term. 5 (black clip). Set control stick for image adjustment on motortester as far as it will go to the left (calibrated setting).

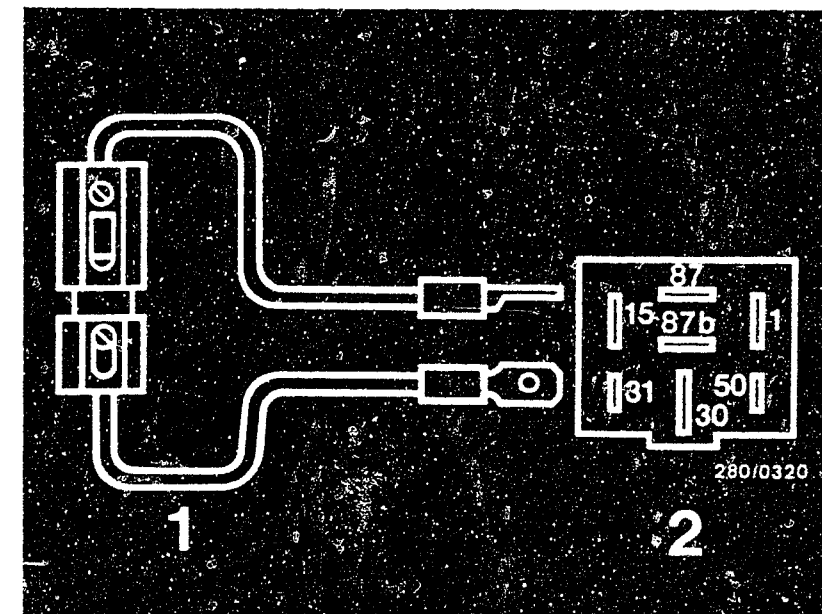
Remove the control relay. Fit a jumper in the connection base between term. 87 and term. 30. Power supply to the control unit.

Deflect air-flow sensor flap suddenly several times. The oscilloscope must show a continuous signal. If incorrect (see illustration) → replace air-flow sensor.

Caution! Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes

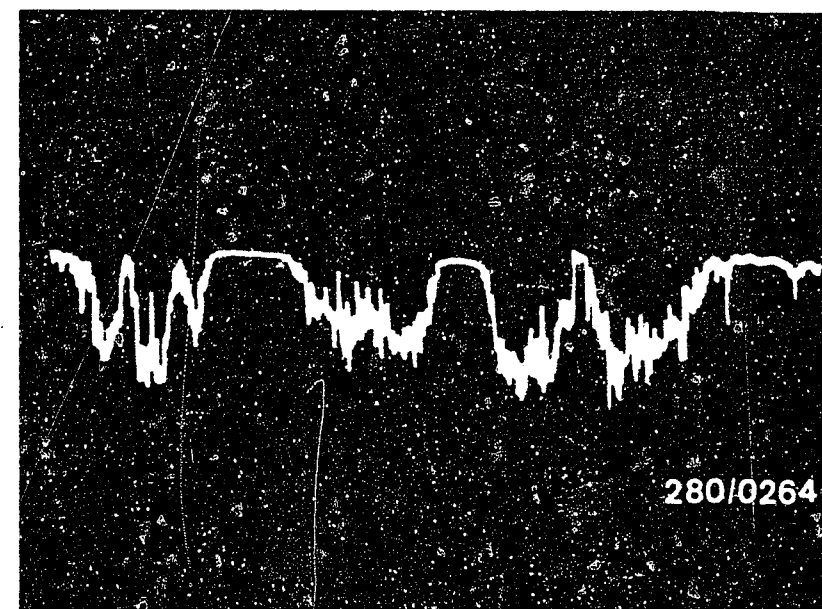
Continued on G9/G10



Jumper (user-fabricated)

1 = Fuse holder with 10 A fuse

2 = Top view of connection base



G7

Engine missing

BMW 5, 6 and 7 series



G8

Engine missing

BMW 5, 6 and 7 series



Engine missing under all operating conditions (continued)

Fuel delivery OK?

yes

no

Measuring the fuel delivery:

For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.

Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30. Fuel pump must operate.

Test specification

2.5 l engine: 850 cm³/30 s

2.8 l engine: 875 cm³/30 s

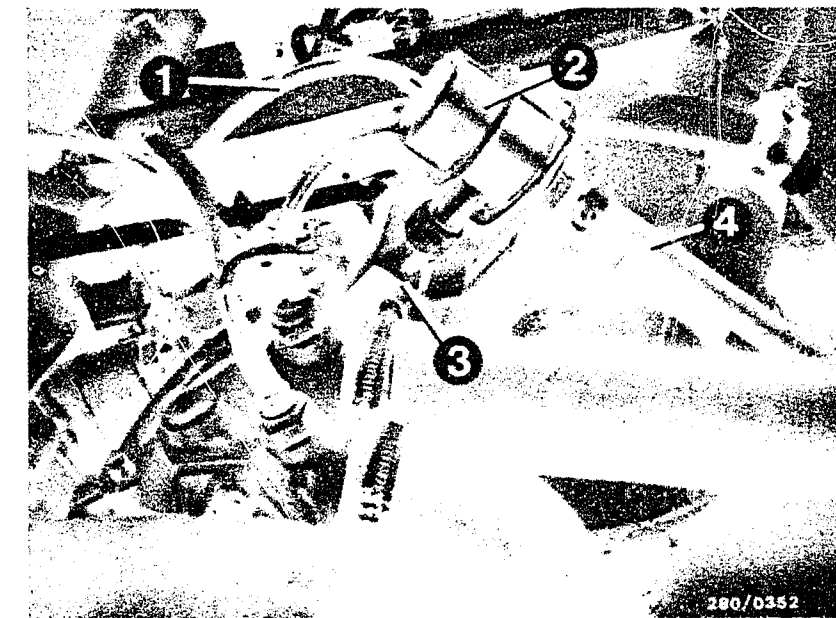
Caution!

Be sure to remove the jumper after you have finished testing.

Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs. With engine running min. 12 V. If not, clean contacts, possibly eliminate poor ground connection. Replace leads.
- Fuel pressure regulator defective → replace.
- Fuel pump delivery too low → replace fuel pump.

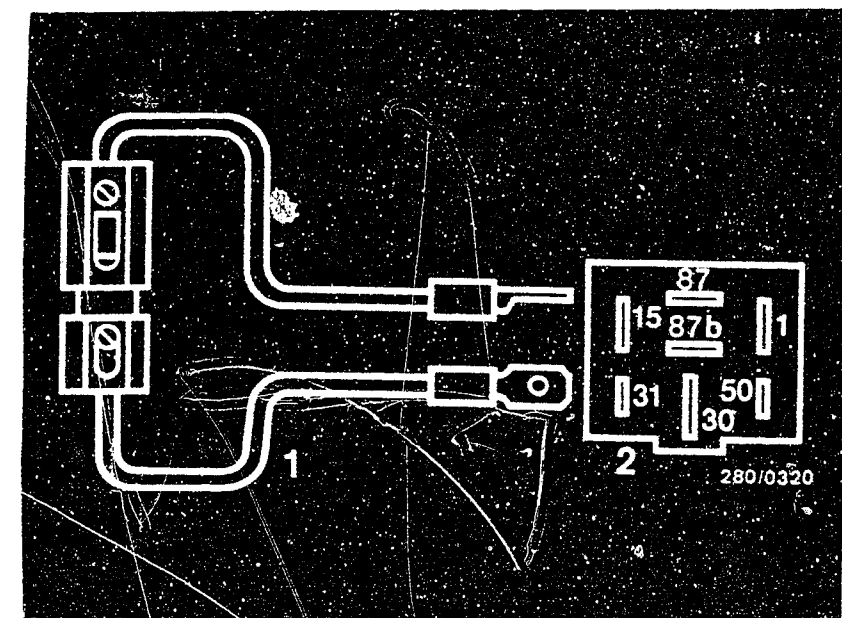
Continued on G11/G12



- 1 = Intake-manifold connection
- 2 = Pressure regulator
- 3 = Fuel-distribution pipe (Fuel delivery line)
- 4 = Fuel return line

Jumper (user-fabricated)

- 1 = Fuse holder with 10 A fuse
- 2 = Control relay (top view of connection base)



G9

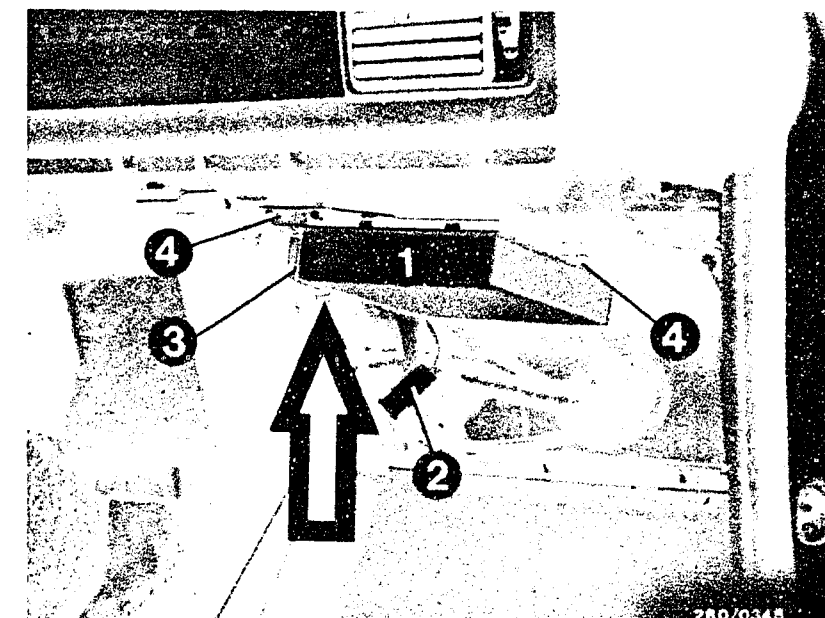
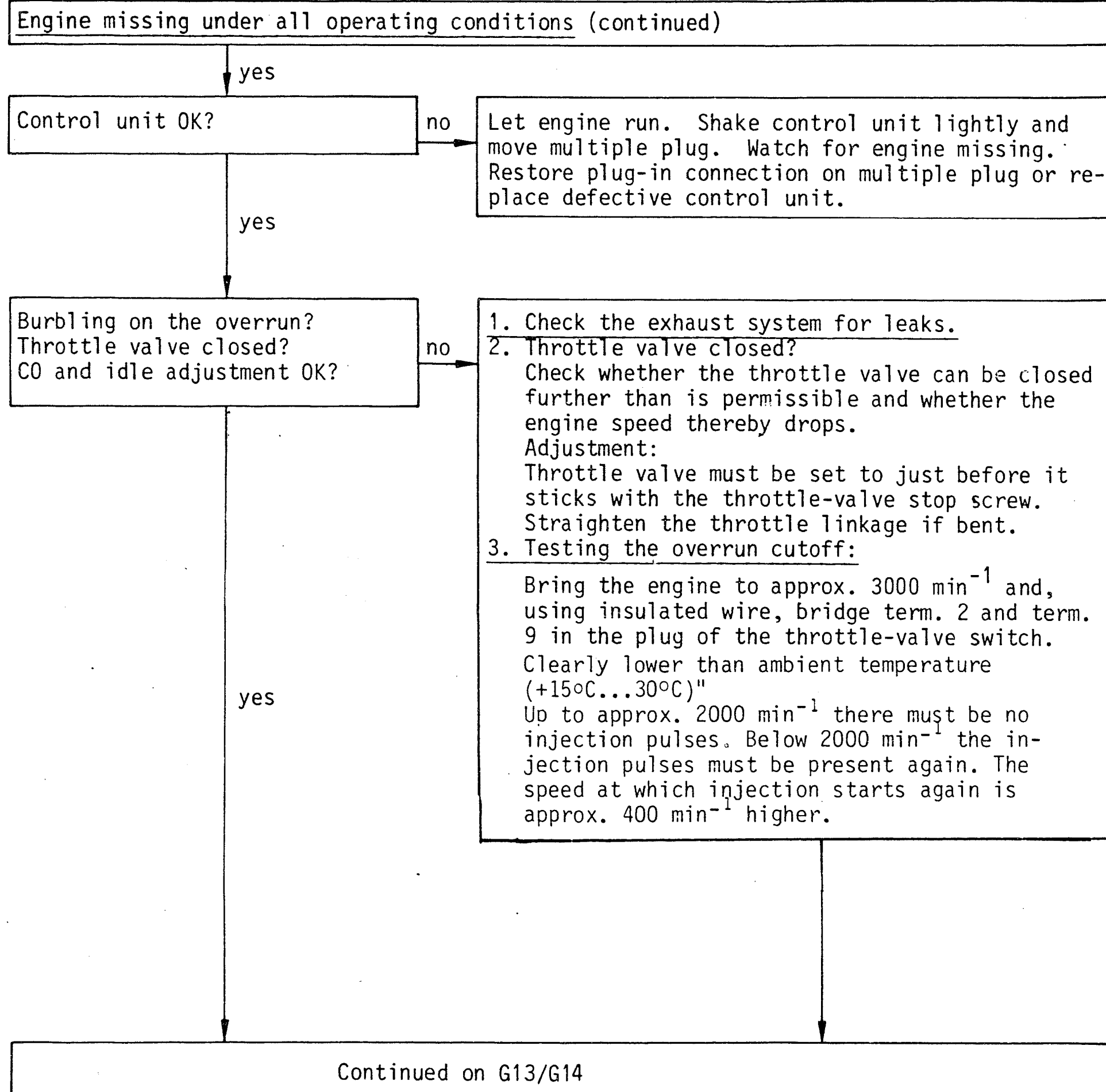
Engine missing under all op.conditions
BMW 5, 6 and 7 series



G10

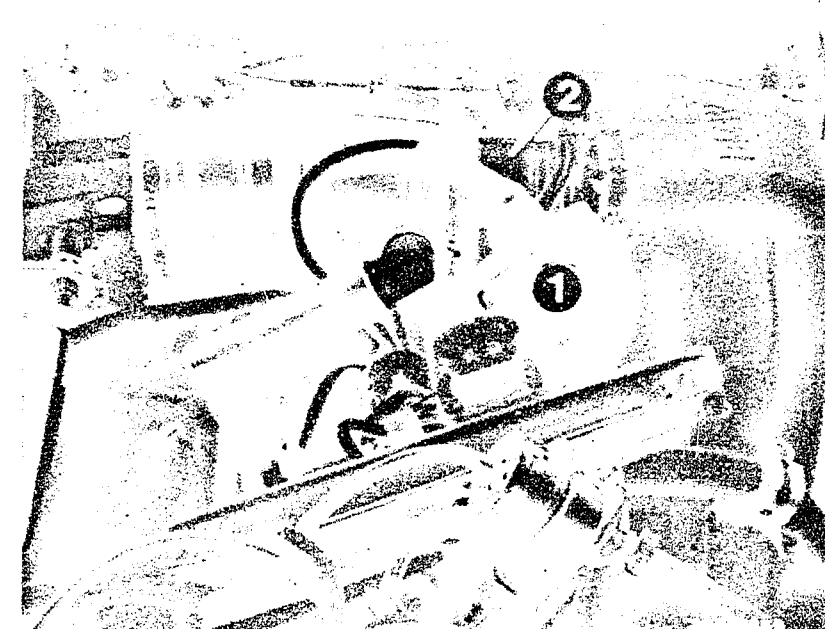
Engine missing under all op.conditions
BMW 5, 6 and 7 series





- 1 = Control unit
- 2 = Plug-in connection term. 1 (lead No. 1)
- 3 = To connect the universal adapter, remove multiple plug (25-pin). To do this, press the detent in the direction of the arrow.
- 4 = Fastening screws

- 1 = Throttle-valve switch
- 2 = Throttle-valve assembly



G11

Engine missing under all op.conditions
BMW 5, 6 and 7 series



G12

Engine missing under all op.conditions
BMW 5, 6 and 7 series



Engine missing under all operating conditions (continued)

Burbling on the overrun?
Throttle valve closed?
CO and idle adjustment OK?
(continued)

no

Engine temperature approx. 80°C:

Up to approx. 1200 min⁻¹ there must be no injection pulses. Below 1200 min⁻¹ the injection pulses must be present again. The reinstatement speed is 400 min⁻¹ higher.

The duration of injection is measured on a solenoid-operated injection valve using a test lead.

If incorrect:

Test leads 2 and 9 for continuity using ohmmeter.

Check the switching function of the idle contact.

If both OK → replace control unit.

4. CO and idle adjustment

Exhaust-gas adjustment with exhaust-gas measuring instrument with engine at normal operating temperature and at idle speed.

Idle speed

Manually-shifted transmission: 800...900 min⁻¹

Automatic transmission

(Selector lever in position

"P"):

800...900 min⁻¹

CO setting:

max. 1.5% by vol. CO

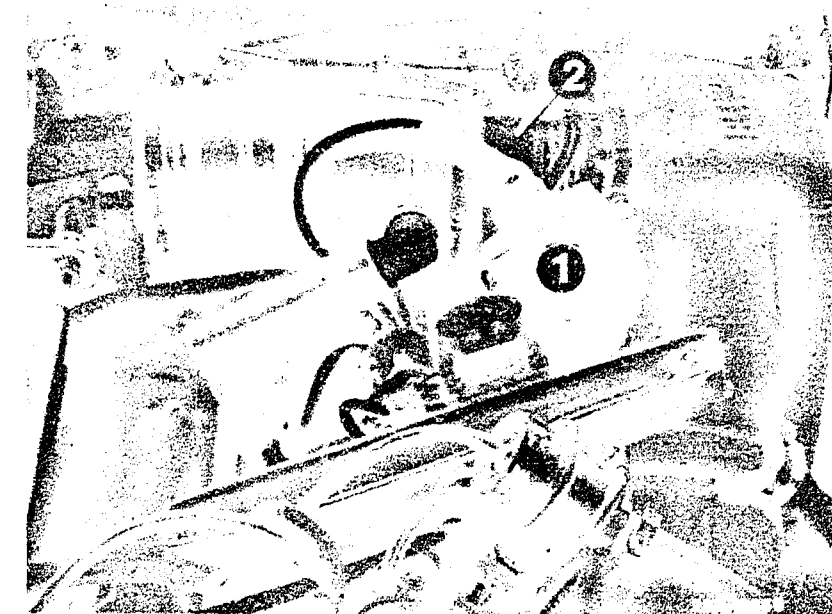
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check idle speed and CO concentration again. If necessary, carry out adjustments in several steps.

After adjusting, use new (red) plugs

(1 280 508 012).

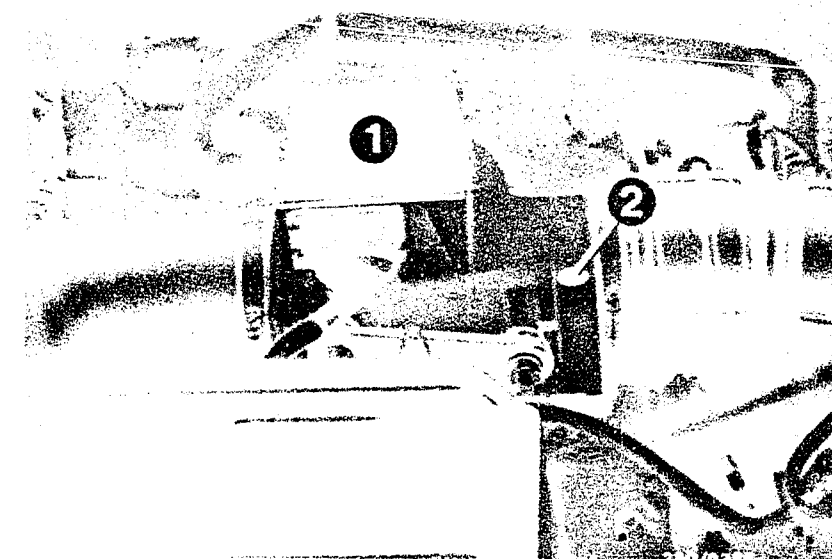
yes

Continued on G15/G16



1 = Throttle-valve switch
2 = Throttle-valve assembly

1 = Air-flow sensor
2 = CO adjusting screw



G13

Engine missing under all op.conditions
BMW 5, 6 and 7 series

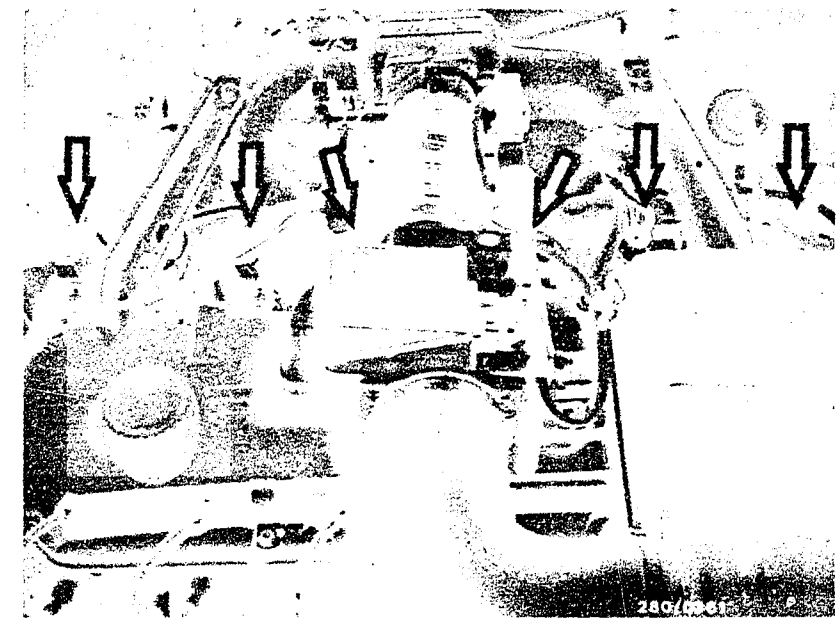
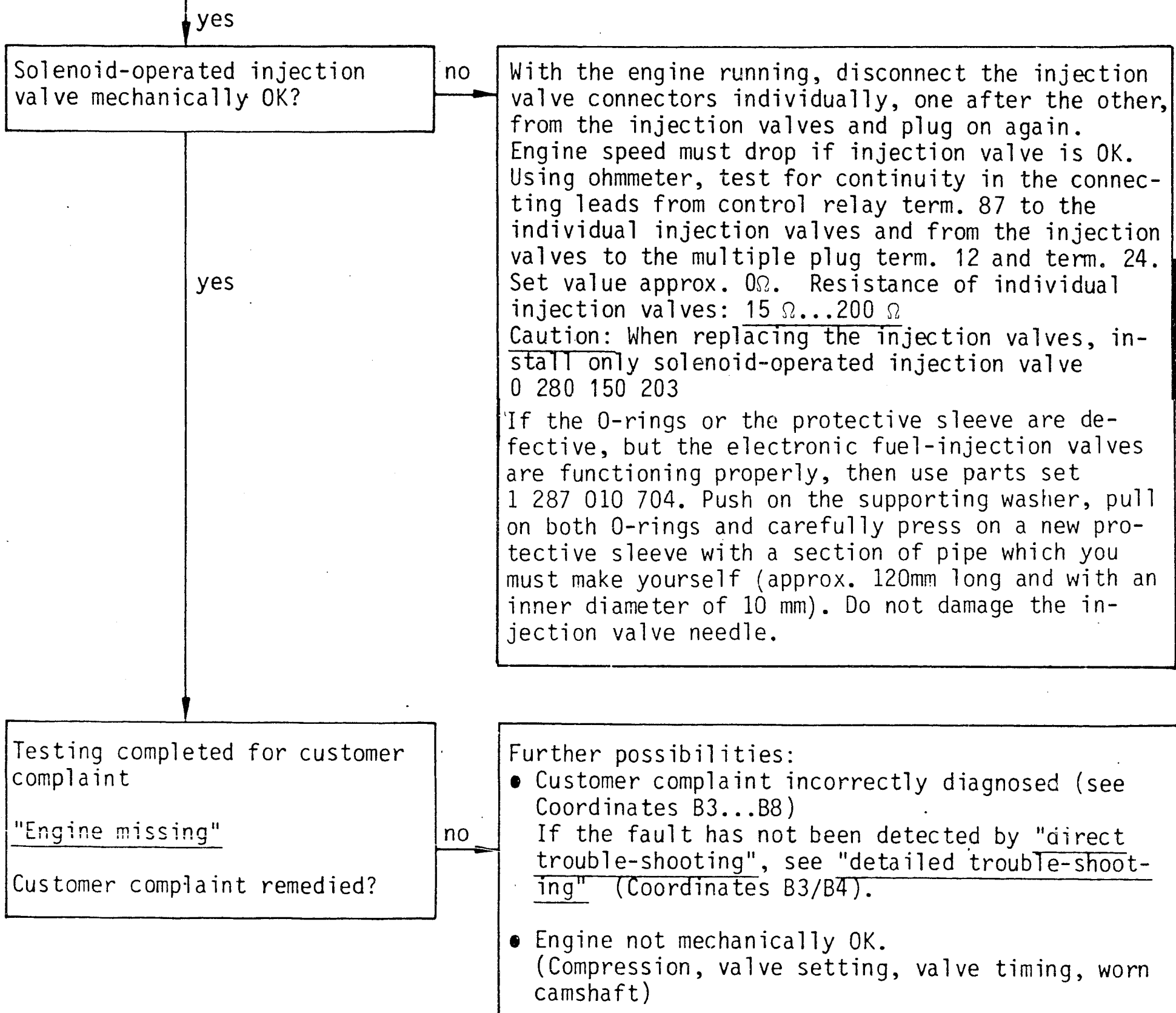


G14

Engine missing under all op.conditions
BMW 5, 6 and 7 series

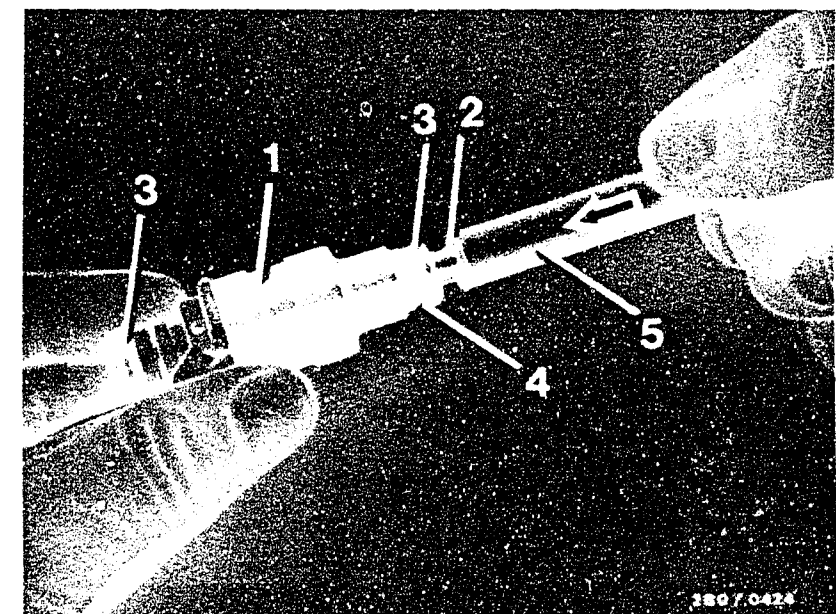


Engine missing under all operating conditions (continued)



Arrows = Solenoid-operated injection valves

- 1 = Fuel-injection valve
- 2 = New protective sleeve
- 3 = O-ring
- 4 = Supporting washer
- 5 = Pipe section



G15

Engine missing under all op.conditions
 BMW 5, 6 and 7 series



G16

Engine missing under all op.conditions
 BMW 5, 6 and 7 series



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

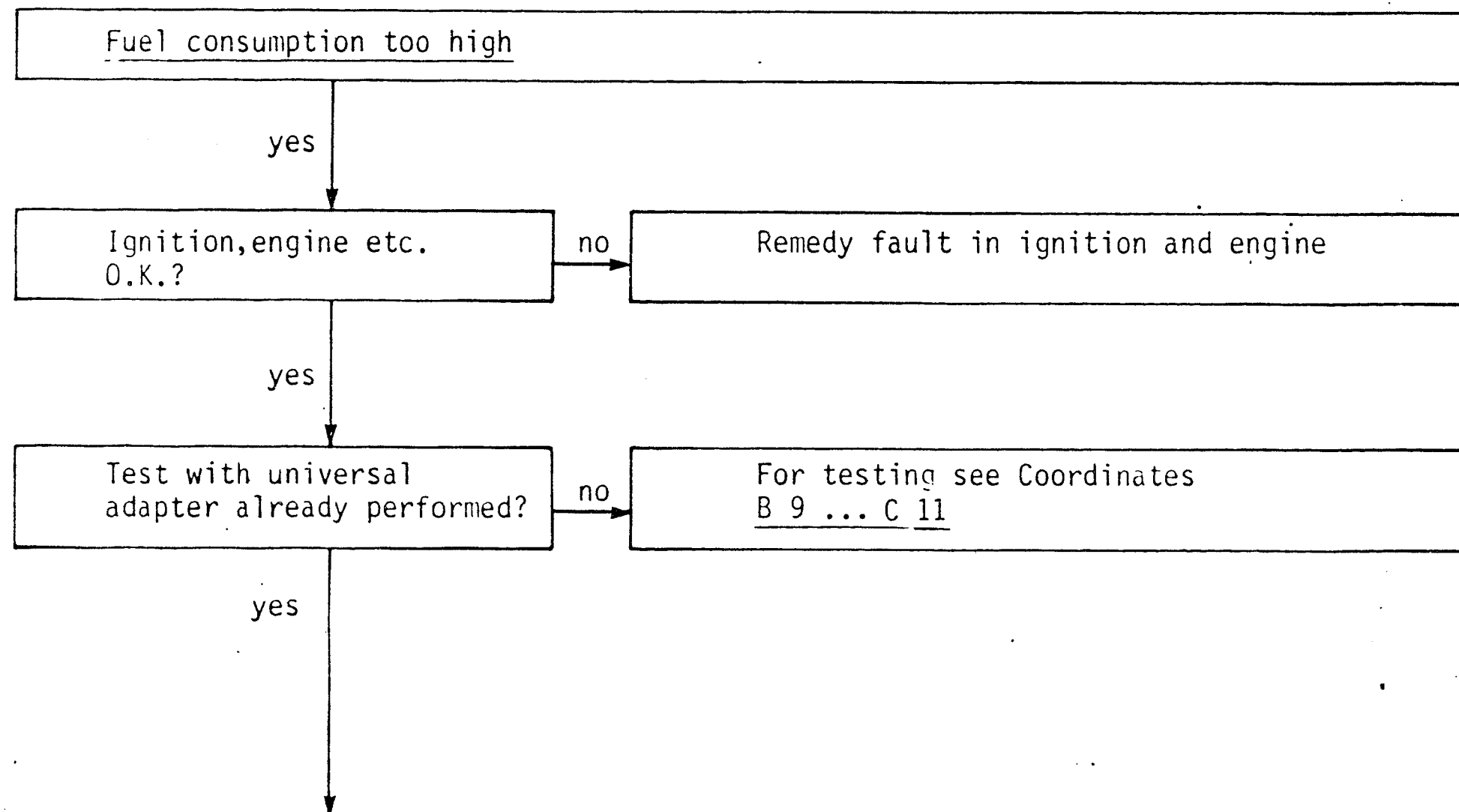
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on G19/G20

G 17

Fuel consumption too high
BMW 5, 6 and 7 series



G 18

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Have all brakes released fully?

yes

Fuel pressure OK?

Test specification: 2.8...3.2 .
bar

Test specification reached?

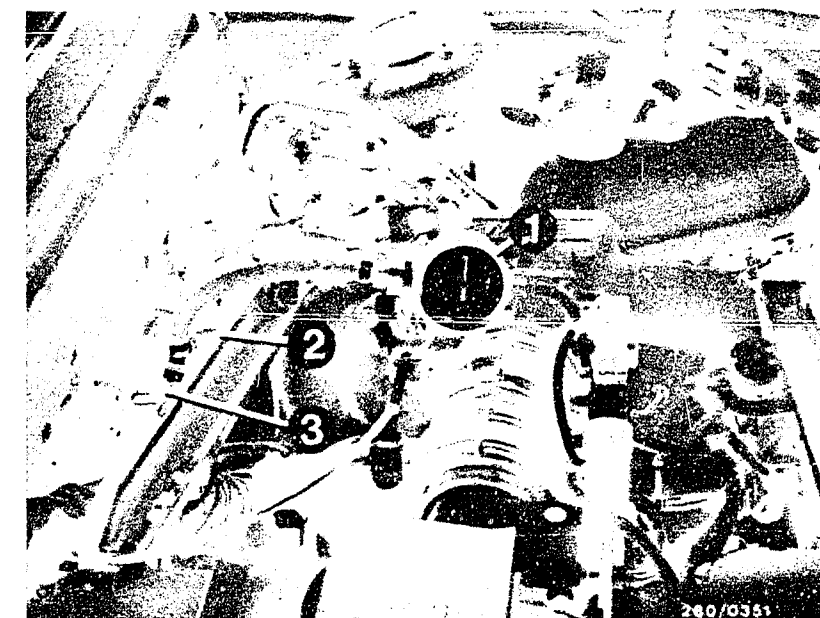
yes

Testing the fuel pressure

Remove hose from fuel delivery line (connection on
fuel-distribution pipe). Connect pressure gauge.

Caution: When tightening the fuel hose make sure
that no fuel gets onto hot parts of the engine.

Continued on G21/G22



1 = Pressure gauge (pressure tester
1 687 231 154)

2 = Fuel delivery line

3 = To fuel-distribution pipe

G 19

Fuel consumption too high
BMW 5, 6 and 7 series



G 20

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Fuel pressure OK?

Test specification: 2.8...3.2 bar

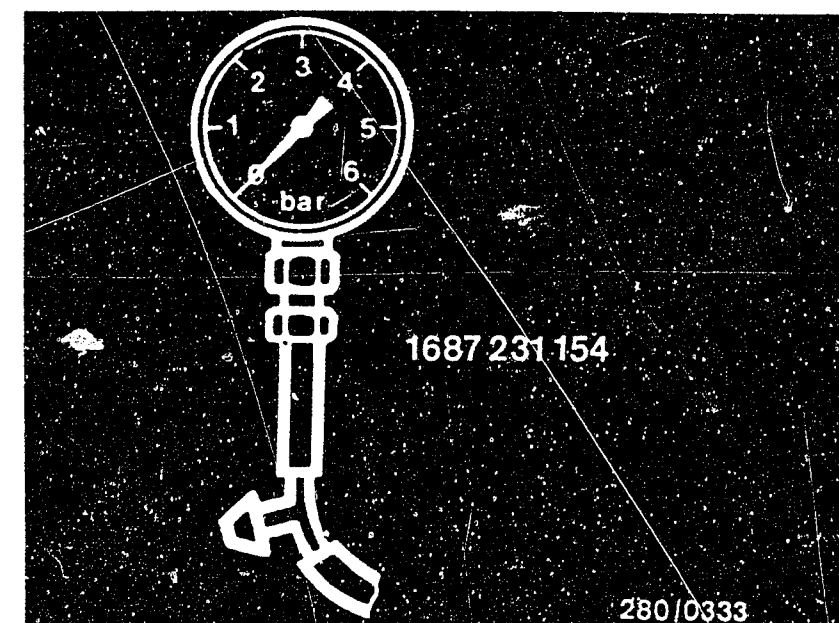
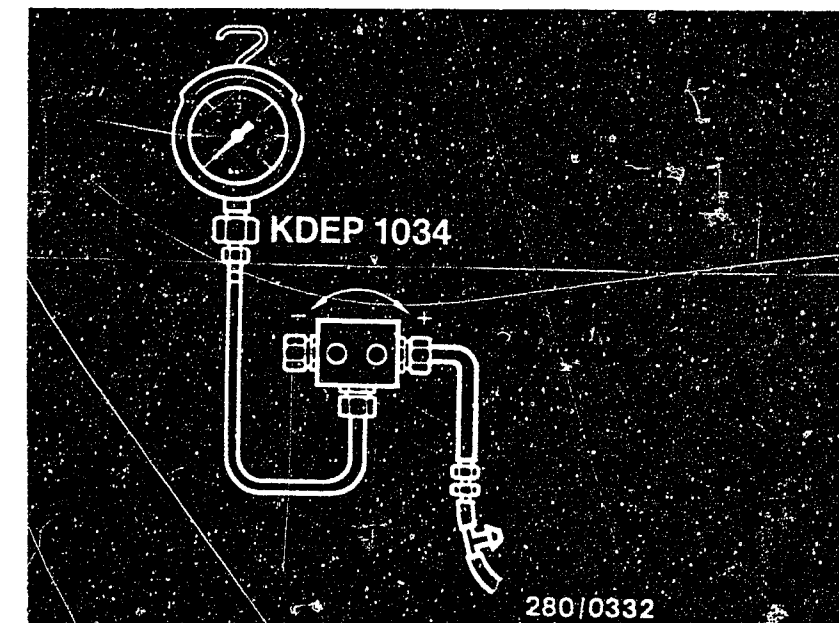
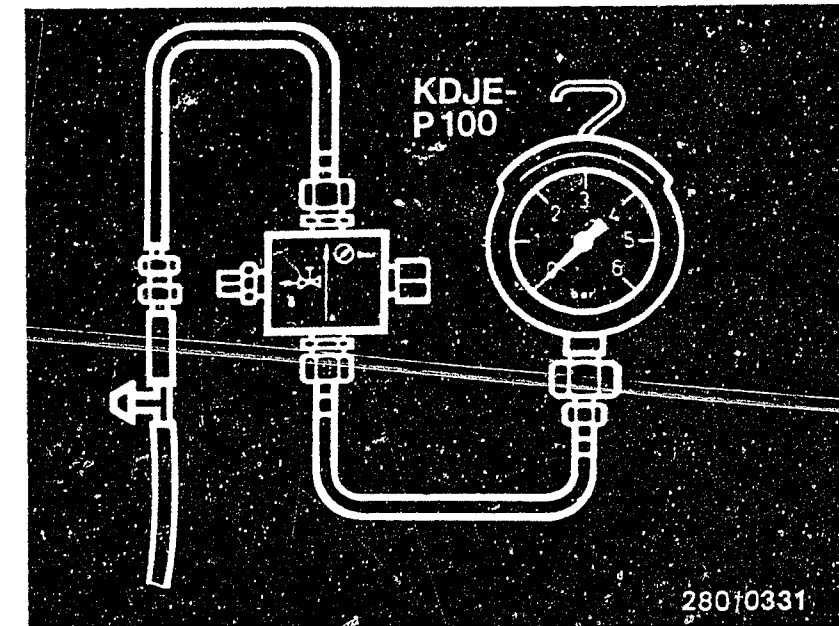
Test specification reached?

no

Connect the connections of the pressure testers into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic. The end of the hose is plugged onto the fuel-distribution pipe, and the free Y-piece is plugged onto the fuel delivery hose to the fuel-distribution pipe. Make sure there are no leaks.

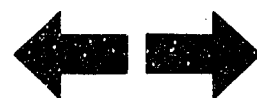
yes

Continued on G23/G24



G21

Fuel consumption too high
BMW 5, 6 and 7 series



G22

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Fuel pressure OK?
Test specification: 2.8...3.2 bar
Pressure regulator OK? Test specification reached?

no

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30. Fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Caution!

Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2,5 bar.

Testing the pressure regulator

Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30. Electric fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Fuel pressure of 2.8 bar not reached:

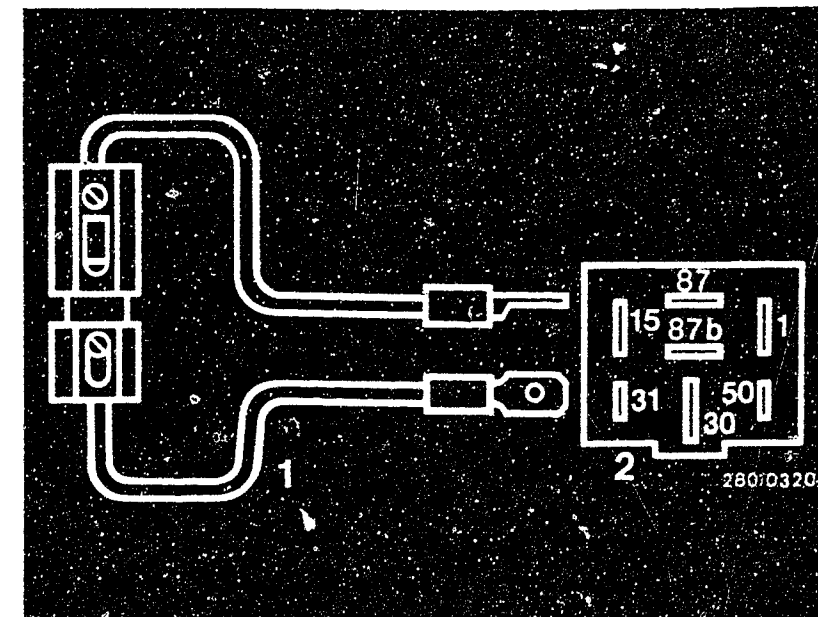
1. Slowly pinch off fuel return line: (Caution: do not load pressure gauge above 6 bar.)

Pressure rises above 4 bar → replace pressure regulator.

Pressure remains below 4 bar → replace fuel pump.

yes

Continued on H1/H2



Jumper (user-fabricated)

1 = Fuse holder with a 10 A fuse

2 = Top view of connection base

1 = Intake-manifold connection

2 = Pressure regulator

3 = Fuel delivery line

4 = Fuel return line



G 23

Fuel consumption too high
BMW 5, 6 and 7 series



G 24

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Fuel pressure OK?
Test specification: 2.8...3.2
bar
Pressure regulator OK?
Test specification reached?

no

2. Check fuel delivery line and filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 3.2 bar exceeded:

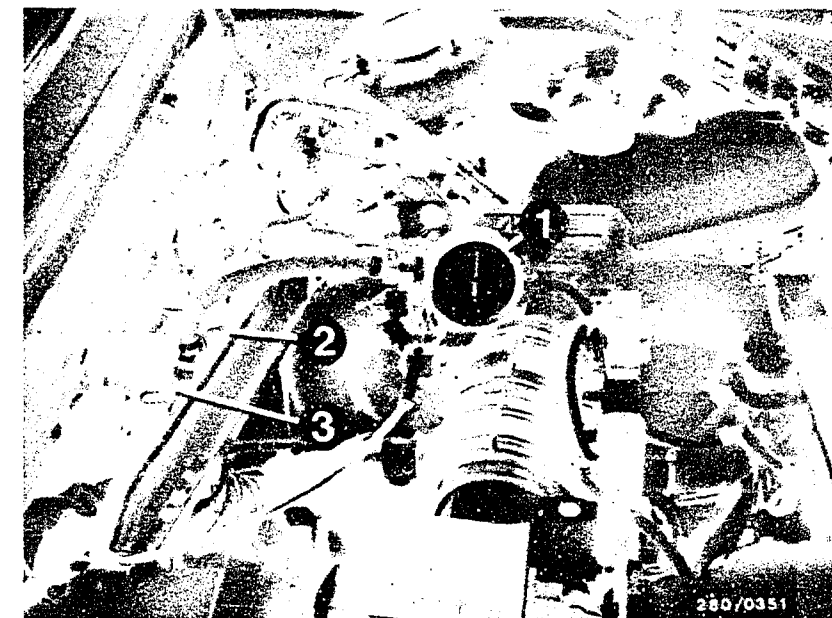
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!

Jumper must be removed again after test is completed, and the control relay must be fitted in position.

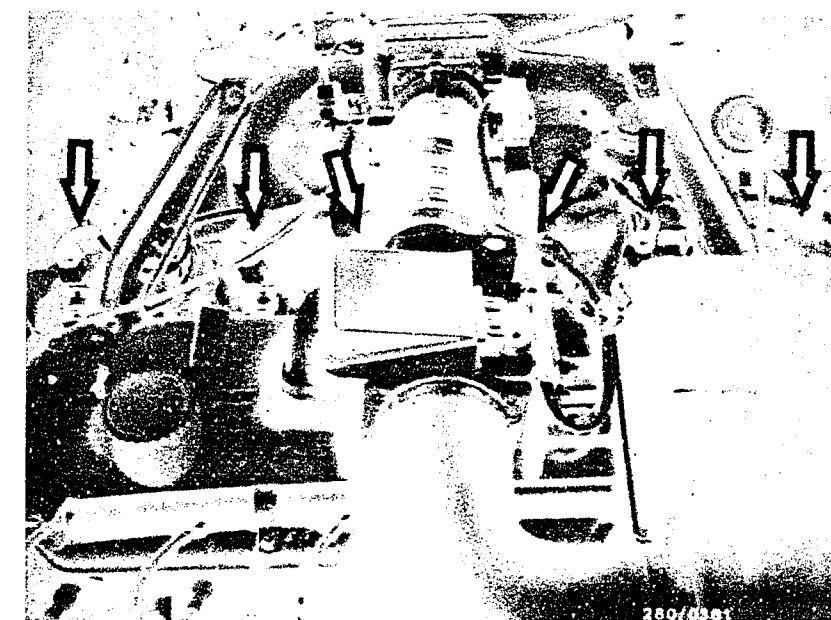
yes

Continued on H3/H4



- 1 = Pressure gauge (pressure tester 1 687 231 154)
2 = Fuel delivery line
3 = To fuel-distribution pipe

- 1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump



H1

Fuel consumption too high
BMW 5, 6 and 7 series



H2

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Solenoid-operated injection valves mechanically OK?

no

If the O-rings or the protective sleeve are defective, but the electronic fuel-injection valves are functioning properly: Carefully lever off the protective sleeve. (With a screwdriver or something similar). Please note: Do not damage the protruding injection-valve nozzle. Lift off both O-rings and pull off the supporting washer. Use parts set 1 287 010 704. Push on the supporting washer, pull on both O-rings and carefully press on a new protective sleeve with a section of pipe which you must make yourself (approx. 120 mm long and with an inner diameter of 10 mm). Do not damage the injection valve needle. If the O-ring (fuel distributor connection) has swollen up, it must also be exchanged.

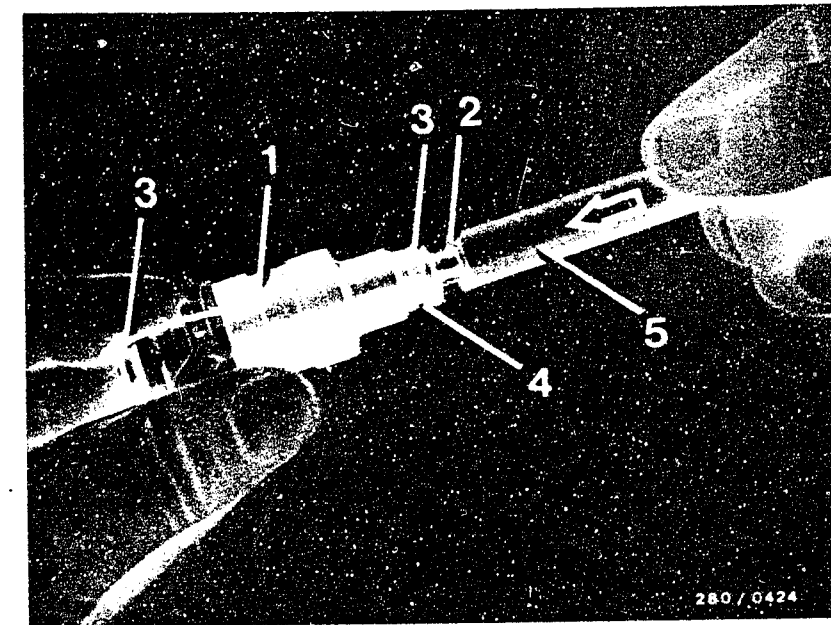
yes

Start valve OK? (Leak test)

no

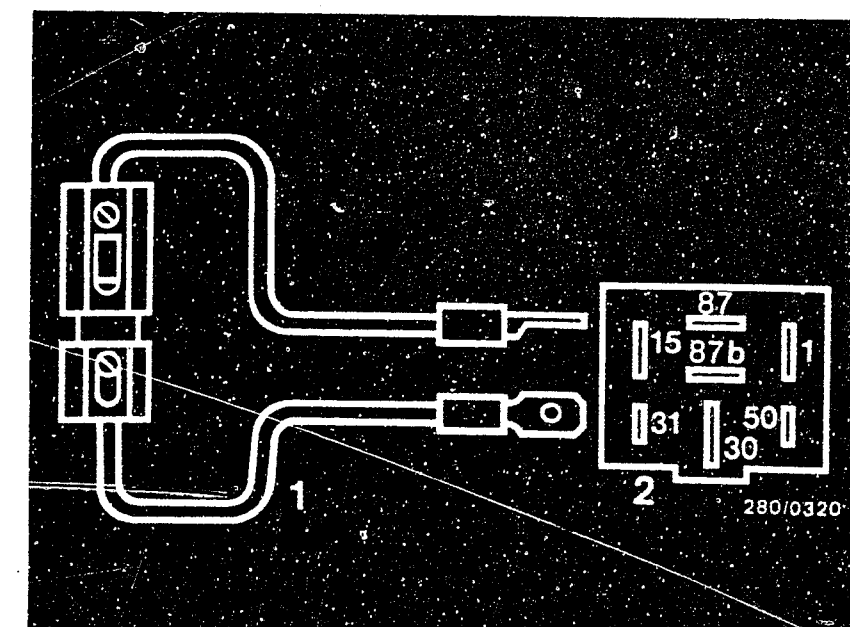
Testing the start valve for leaks:
 1. When installed: Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.
 2. When removed: Remove the start valve (caution! fire hazard!). Fuel line and electric lead remain connected. (Place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).
 Caution! The jumper must be removed again after test is completed and the control relay must be fitted in position. Test specification: within one minute max. 1 drop may form at the mouth of the valve.

Continued on H5/H6



- 1 = Fuel-injection valve
- 2 = New protective sleeve
- 3 = O-ring
- 4 = Supporting washer
- 5 = Pipe section

- Jumper (user-fabricated)
- 1 = Fuse holder with 10 A fuse
 - 2 = Top view of connection base



H3

Fuel consumption too high
BMW 5, 6 and 7 series



H4

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Temperature sensors tested?

no

Testing:

Temperature sensor I measures the intake air temperature and is located in the air duct of the air-flow sensor. Measure the following resistance value between term. 8 and term. 9 of the air-flow sensor: $160...300\ \Omega$

Make direct resistance measurement at temperature sensor II (engine) using ohmmeter.

Resistance measurement at term. 10 and term. 38 (ground):

At ambient temperature ($+15^{\circ}\text{C}..30^{\circ}\text{C}$): $1.3..3.6\text{k}\ \Omega$

At operating temperature ($+80^{\circ}\text{C}$): $250..390\ \Omega$

If incorrect, check for open circuit or short circuit in the following leads using ohmmeter:

Temperature sensor I:

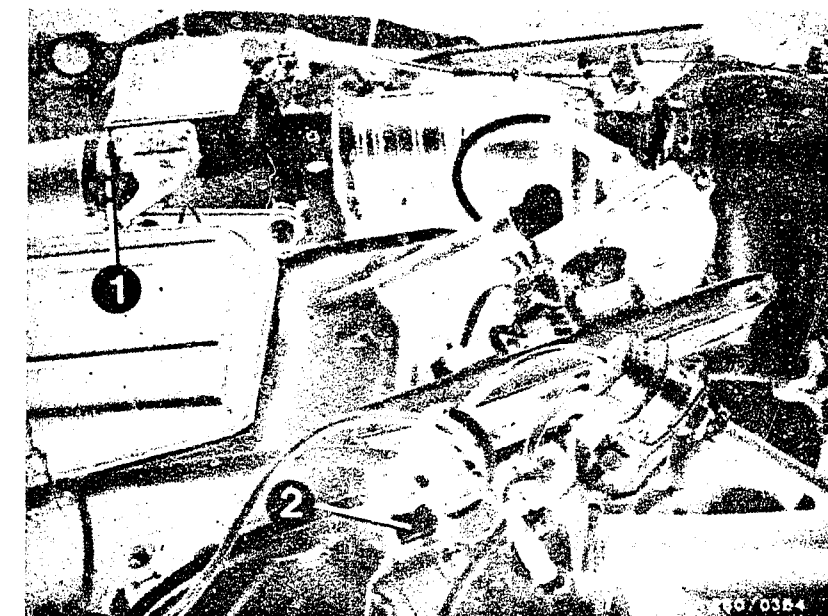
Multiple plug term. 8 to air-flow sensor term. 8 and air-flow sensor term. 9 to multiple plug term. 9.

Temperature sensor II:

Multiple plug term. 10 to temperature sensor II term. 10 and temperature sensor II term. 38 to electronics ground terminal (lead 38).

Check all contacts in the plug-in connections.

yes



- 1 = Temperature sensor I
(in the air inlet side of the air-flow sensor)
- 2 = Temperature sensor II
(in the engine cooling system)

Continued on H7/H8

H5

Fuel consumption too high
BMW 5, 6 and 7 series



H6

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Air-flow sensor O.K.?

no

Testing:

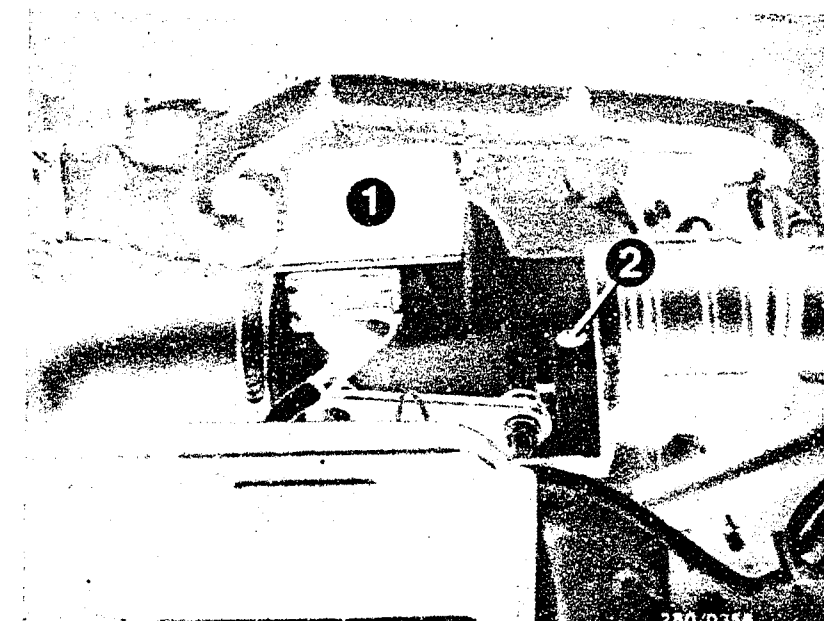
Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: $160...300\ \Omega$.

Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: $60...1000\ \Omega$. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes

Continued on H9/H10



1=Air-flow sensor

2=CO adjusting screw

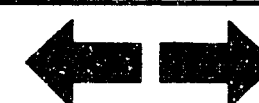
H7

Fuel consumption too high
BMW 5, 6 and 7 series



H8

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

CO and idle speed correctly adjusted?

no

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.
Idle speed:

Manually-shifted transmission: $800 \dots 900 \text{ min}^{-1}$

Automatic transmission
(Selector lever in position "P"):

$800 \dots 900 \text{ min}^{-1}$

CO setting $\text{max. } 1.5\% \text{ by vol. CO}$

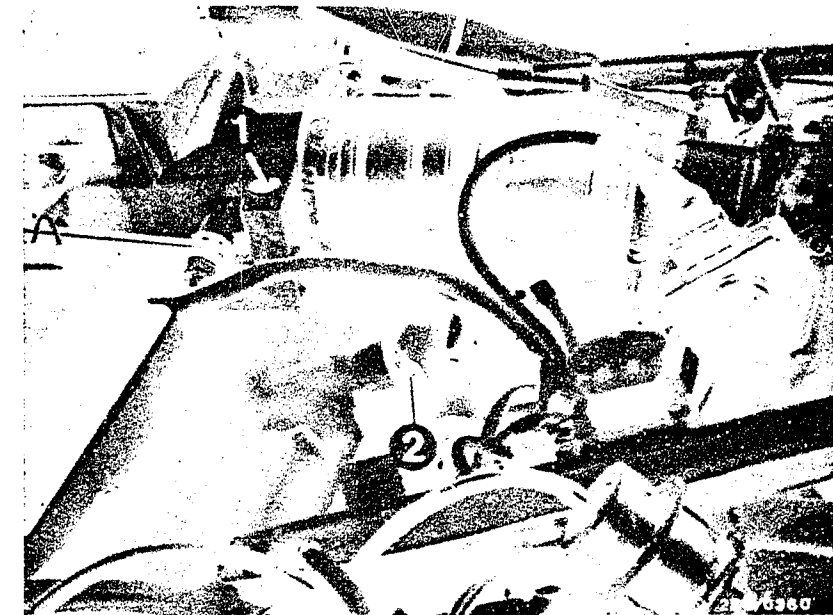
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check idle speed and CO concentration again. If necessary, carry out adjustments in several steps. After adjusting, use new (red) plugs (1 280 508 012).

yes

Can engine speed not be adjusted?

yes

Continued on H11/H12



1 = CO adjusting screw
2 = Idle-speed-adjusting screw

H9

Fuel consumption too high
BMW 5, 6 and 7 series



H10

Fuel consumption too high
BMW 5, 6 and 7 series



Fuel consumption too high (continued)

Testing completed for customer complaint

"Fuel consumption too high"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

H11

Fuel consumption too high

BMW 5, 6 and 7 series



H12

Fuel consumption too high

BMW 5, 6 and 7 series



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

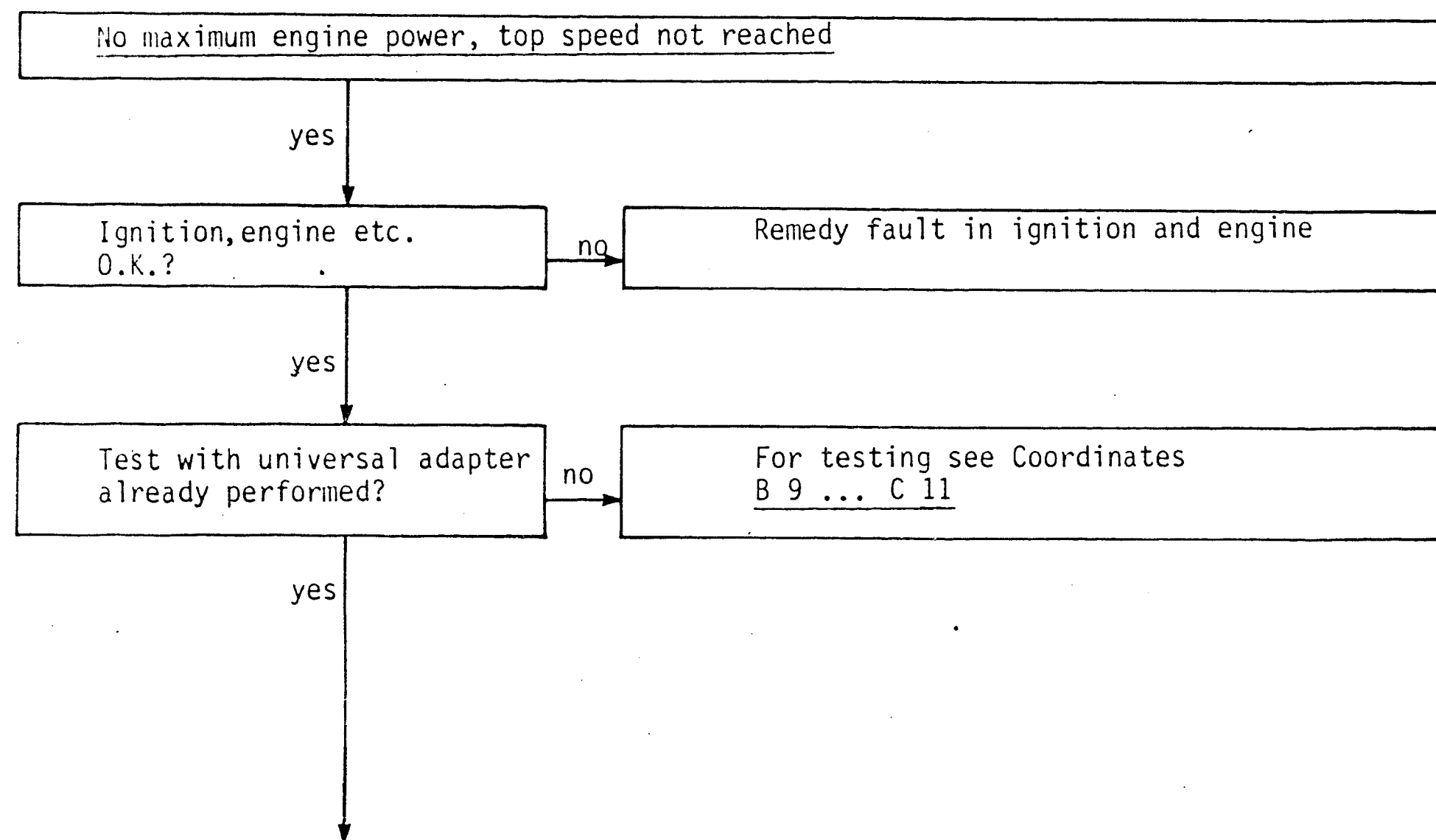
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3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on H15/H16

H13

No maximum engine power
BMW 5, 6 and 7 series



H14

No maximum engine power
BMW 5, 6 and 7 series



No maximum engine power, top speed not reached (continued)

Does throttle valve open fully?

no

Throttle linkage, accelerator pedal OK?
Straighten linkage if necessary. Throttle linkage may stick due to floor mat etc. Using ohmmeter, test for continuity in lead term. 3 from multiple plug to throttle-valve switch term. 3 and from throttle-valve switch term. 9 to multiple plug term. 9. Set value approx. 0 Ω .

yes

Fuel pressure OK?

Test specification: 2.8...3.2 bar

no

Testing the fuel pressure
Remove hose from the fuel delivery line (connection on fuel-distribution pipe). Connect pressure gauge.

Caution:

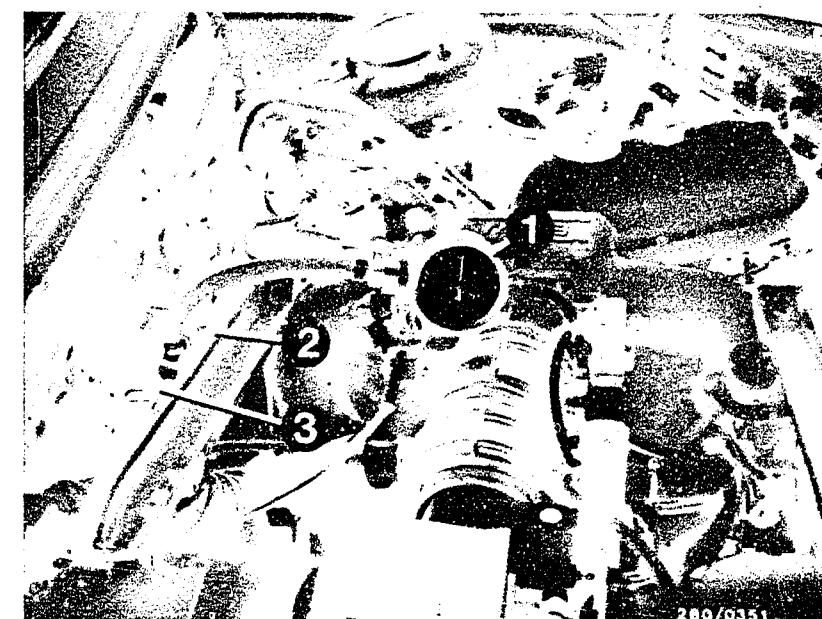
When removing the fuel hose, make sure that no fuel gets onto hot parts of the engine.

Test specification reached?

yes

Continued on H17/H18

- 1 = Pressure gauge (pressure tester 1 687 231 154)
- 2 = Fuel delivery line
- 3 = To fuel-distribution pipe



H15

No maximum engine power
BMW 5, 6 and 7 series



H16

No maximum engine power
BMW 5, 6 and 7 series



No maximum engine power, top speed not reached (continued)

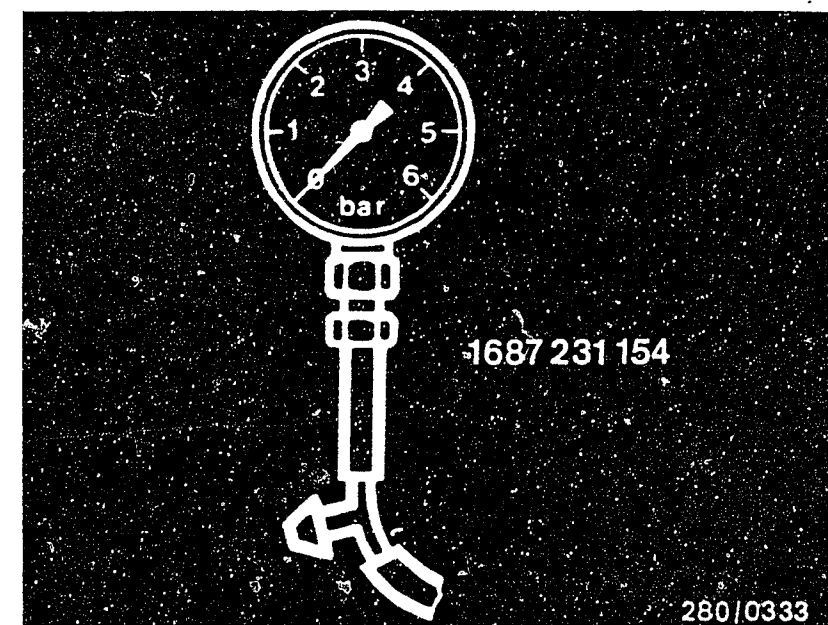
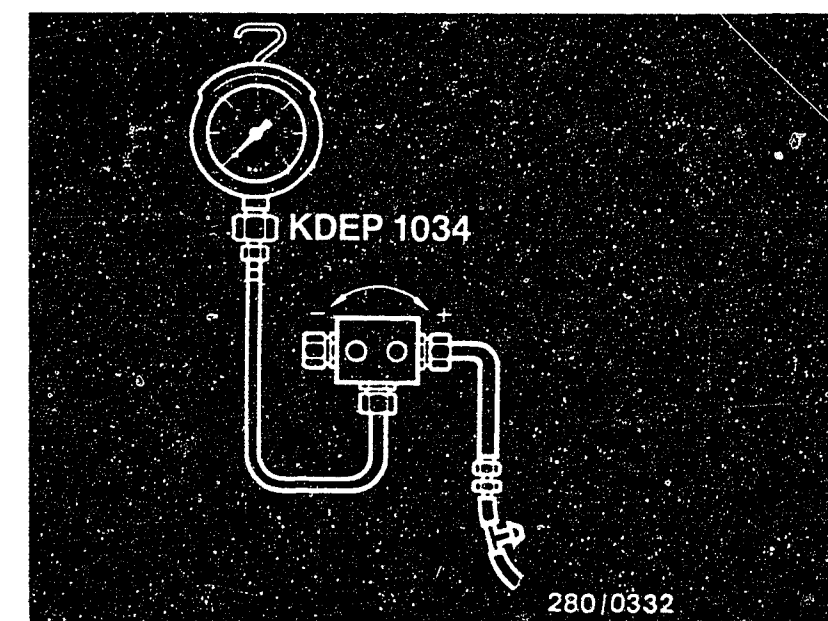
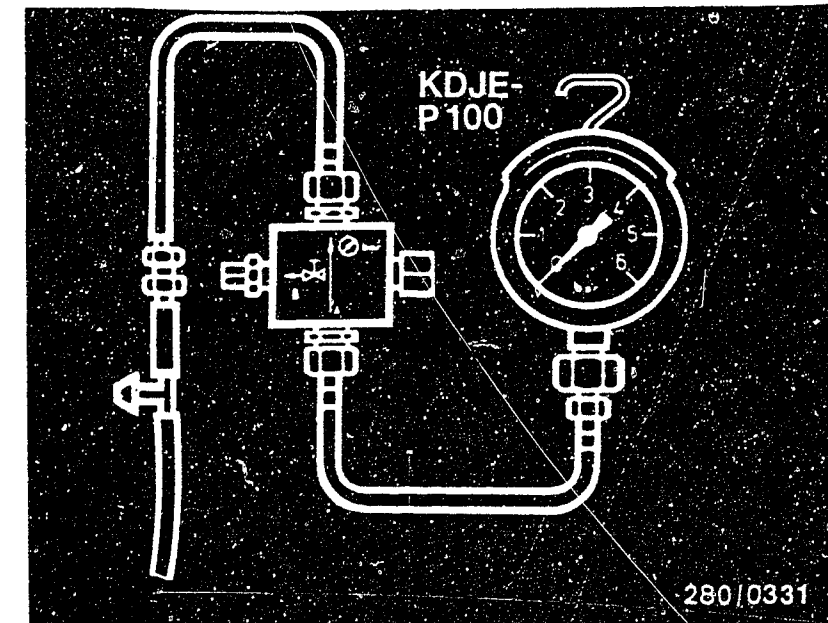
Fuel pressure OK?
Test specification: 2.8...3.2
bar
Test specification reached?

no

Connect the connections of the pressure testers into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic. The end of the hose is plugged onto the fuel-distribution pipe, and the free Y-piece is plugged onto the fuel delivery hose to the fuel-distribution pipe. Make sure there are no leaks.

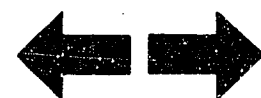
yes

Continued on H19/H20



H17

No maximum engine power
BMW 5, 6 and 7 series



H18

No maximum engine power
BMW 5, 6 and 7 series



No maximum engine power, top speed not reached (continued)

Fuel pressure OK?
Test specification: 2.8...3.2
bar
Pressure regulator OK? Test
specification reached?

no

Remove the control relay. Fit a jumper into the
connection base between term. 87b and term. 30.
Fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Caution!

Remove the jumper and fit the control relay in
position. Let the engine idle → fuel pump pressure
approx. 2,5 bar.

Testing the pressure regulator

Remove the control relay and fit a jumper into the
connection base between term. 87b and term. 30.
Electric fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Fuel pressure of 2.8 bar not reached:

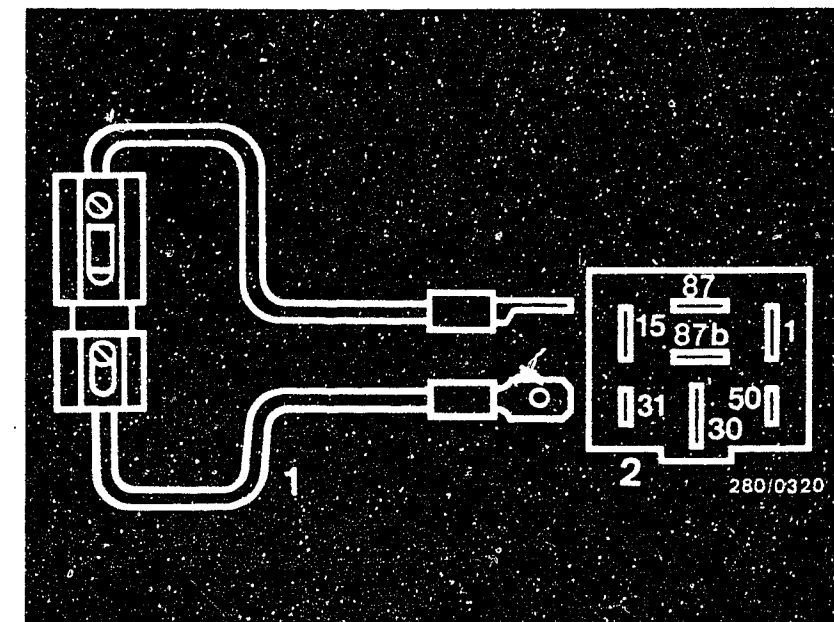
1. Slowly pinch off fuel return line: (Caution: do
not load pressure gauge above 6 bar.)

Pressure rises above 4 bar → replace pressure regu-
lator.

Pressure remains below 4 bar → replace fuel pump.

yes

Continued on H21/H22



Jumper (user-fabricated)

1 = Fuel holder with a 10 A fuse

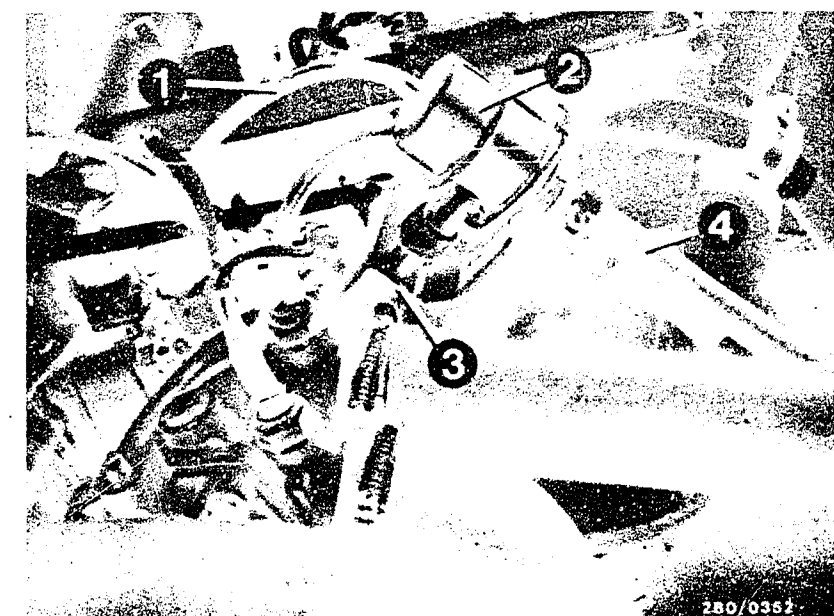
2 = Top view of connection base

1 = Intake-manifold connection

2 = Pressure regulator

3 = Fuel delivery line

4 = Fuel return line



H19

No maximum engine power
BMW 5, 6 and 7 series



H20

No maximum engine power
BMW 5, 6 and 7 series



No maximum engine power, top speed not reached (continued)

Fuel pressure OK?
Test specification: 2.8...3.2
bar
Pressure regulator OK?
Test specification reached?

no

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 3.2 bar exceeded:

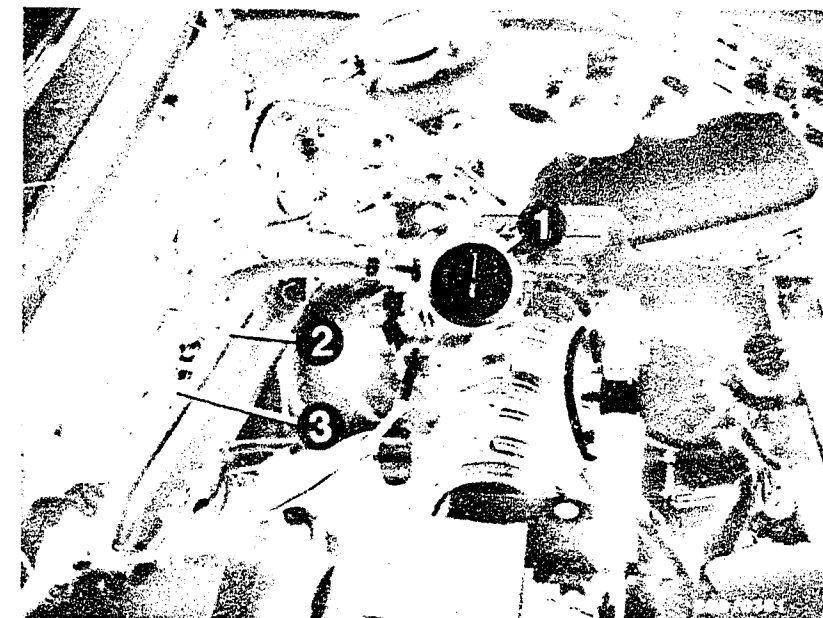
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!

Jumper must be removed again after test is completed, and the control relay must be fitted in position.

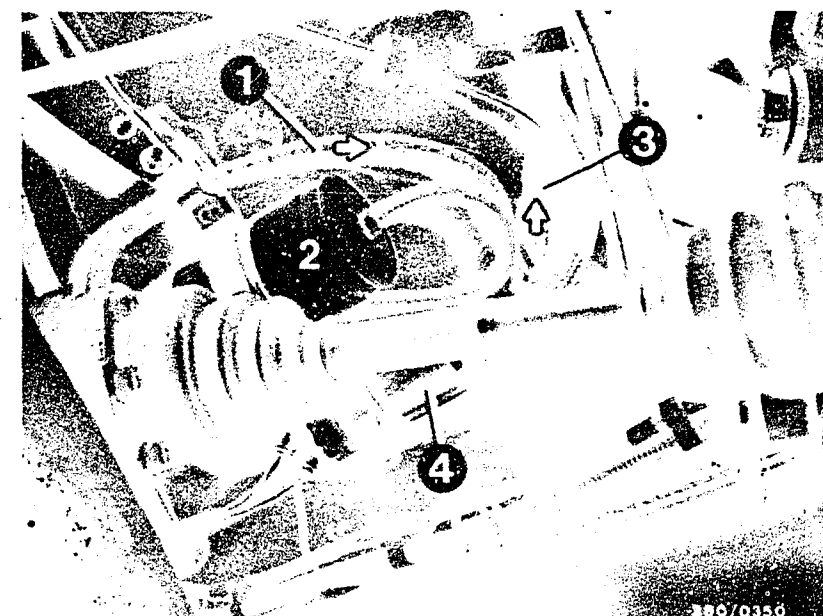
yes

Continued on H23/H24



- 1 = Pressure gauge (pressure tester
1 687 231 154)
2 = Fuel delivery line
3 = To fuel-distribution pipe

- 1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump



H21

No maximum engine power
BMW 5, 6 and 7 series



H22

No maximum engine power
BMW 5, 6 and 7 series



No maximum engine power, top speed not reached (continued)

Fuel delivery OK?

yes

Continued on J1/J2

no

Measuring the fuel delivery:

For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.

Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.

Fuel pump must operate.

Test specification:

2.5 l engine: 850 cm³/30 s

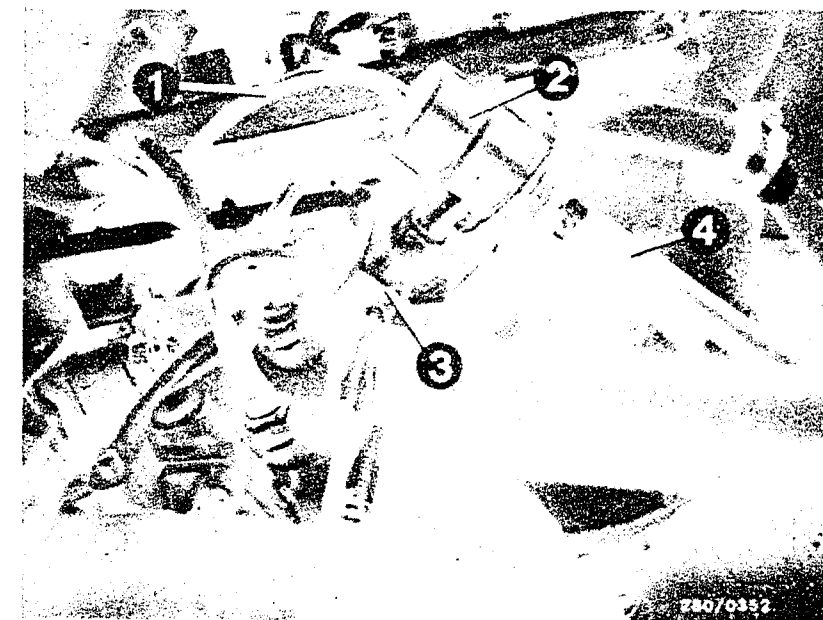
2.8 l engine: 875 cm³/30 s

Caution!

Be sure to remove the jumper after you have finished testing.

Remedy if test specification not reached:

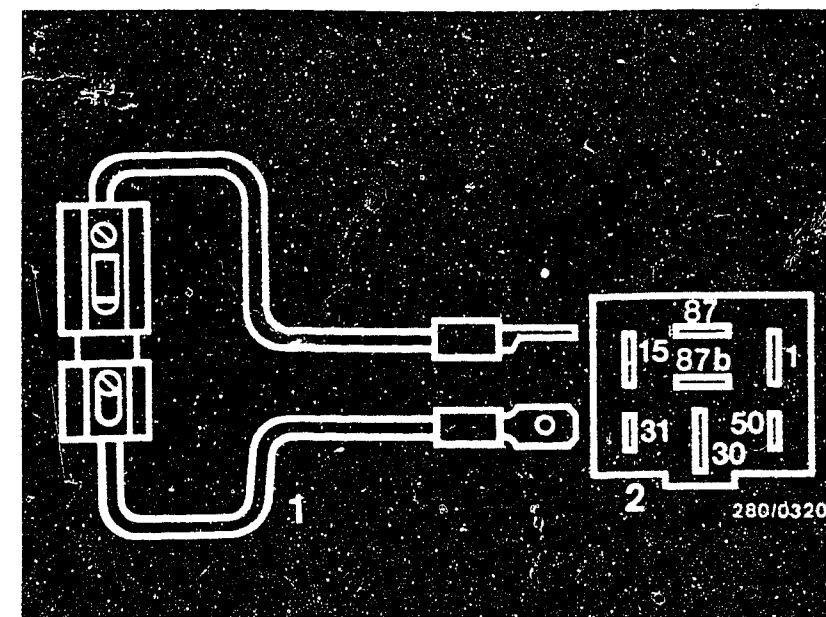
- Fuel filter clogged → replace
- Voltage at fuel pump plugs. With engine running min. 12 V. If not, clean contacts, possibly eliminate poor ground connection. Replace leads.
- Fuel pressure regulator defective → replace.
- Fuel pump delivery too low → replace fuel pump.



- 1 = Intake-manifold connection
2 = Pressure regulator
3 = Fuel-distribution pipe
(Fuel delivery line)
4 = Fuel return line

Jumper (user-fabricated)

- 1 = Fuse holder with 10 A fuse
2 = Top view of connection base



H23

No maximum engine power
BMW 5, 6 and 7 series



H24

No maximum engine power
BMW 5, 6 and 7 series



No maximum engine power, top speed not reached (continued)

Air-flow sensor O.K.?

no

Testing:

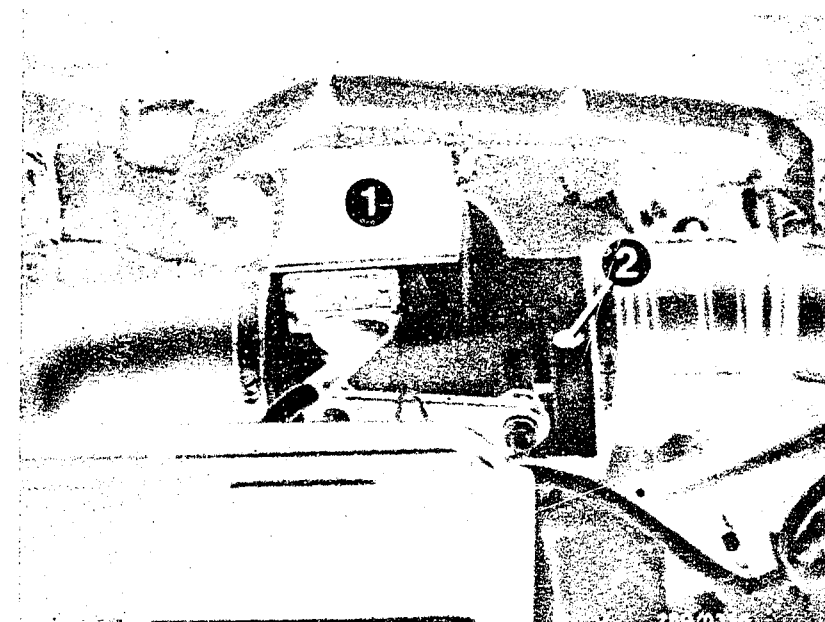
Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω .

Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60...1000 Ω . Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes

Continued on J3/J4



1=Air-flow sensor
2=CO adjusting screw

J1

No maximum engine power
BMW 5, 6 and 7 series

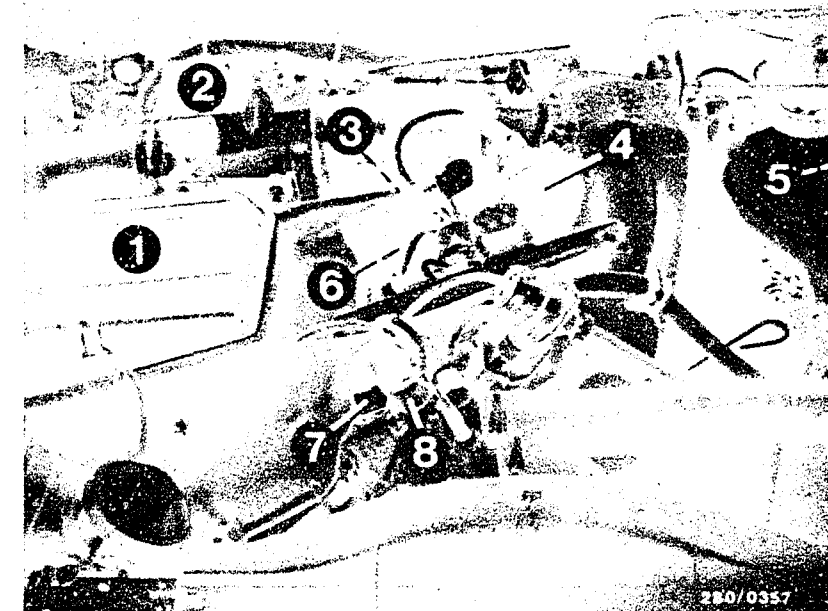
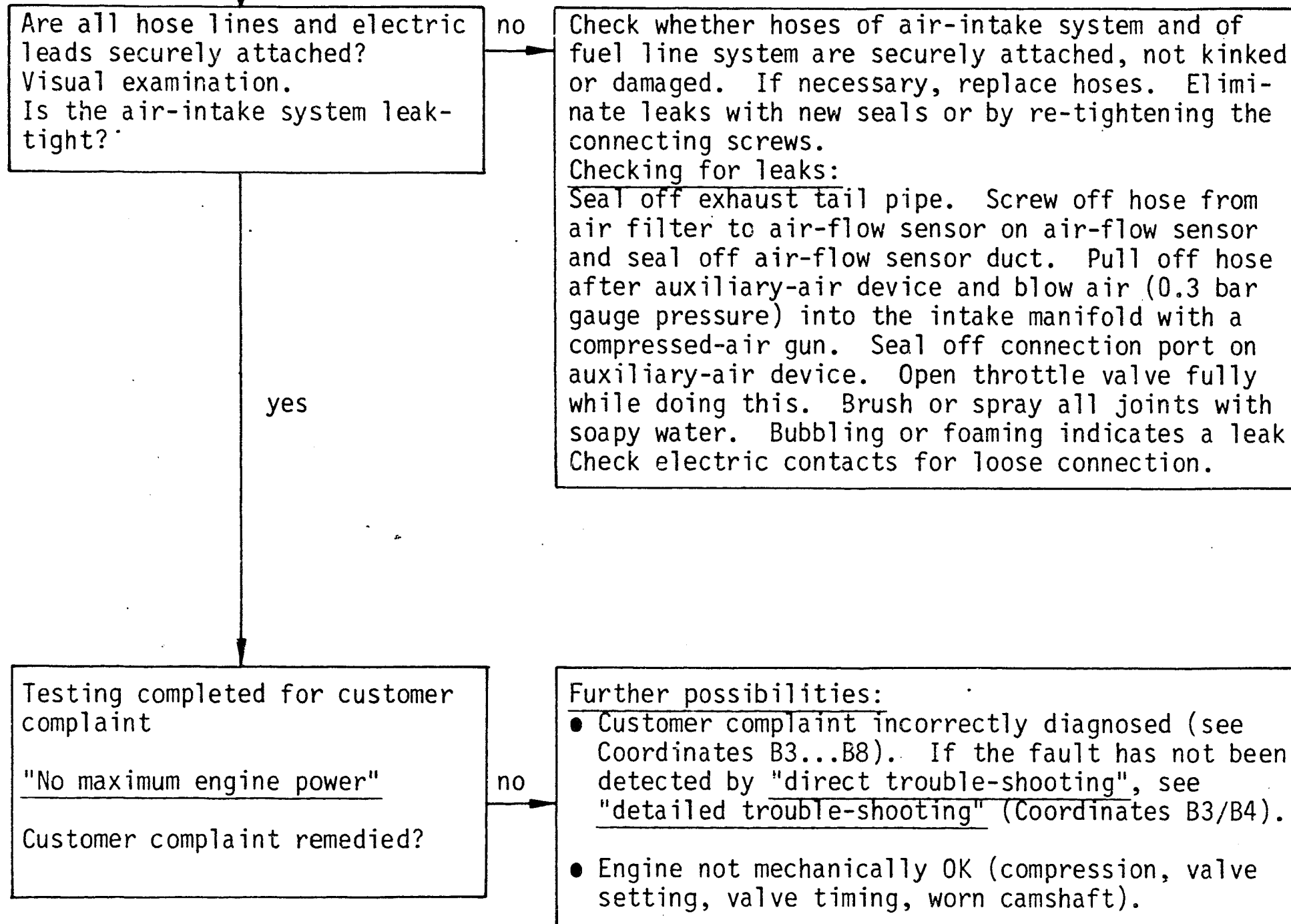


J2

No maximum engine power
BMW 5, 6 and 7 series



No maximum engine power, top speed not reached (continued)



- 1 = Air filter
- 2 = Air-flow sensor
- 3 = Start valve
- 4 = Throttle-valve switch
- 5 = Control relay
- 6 = Auxiliary-air device
- 7 = Temperature sensor II (white plug)
- 8 = Thermo-time switch

J3

No maximum engine power
BMW 5, 6 and 7 series



J4

No maximum engine power
BMW 5, 6 and 7 series



Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

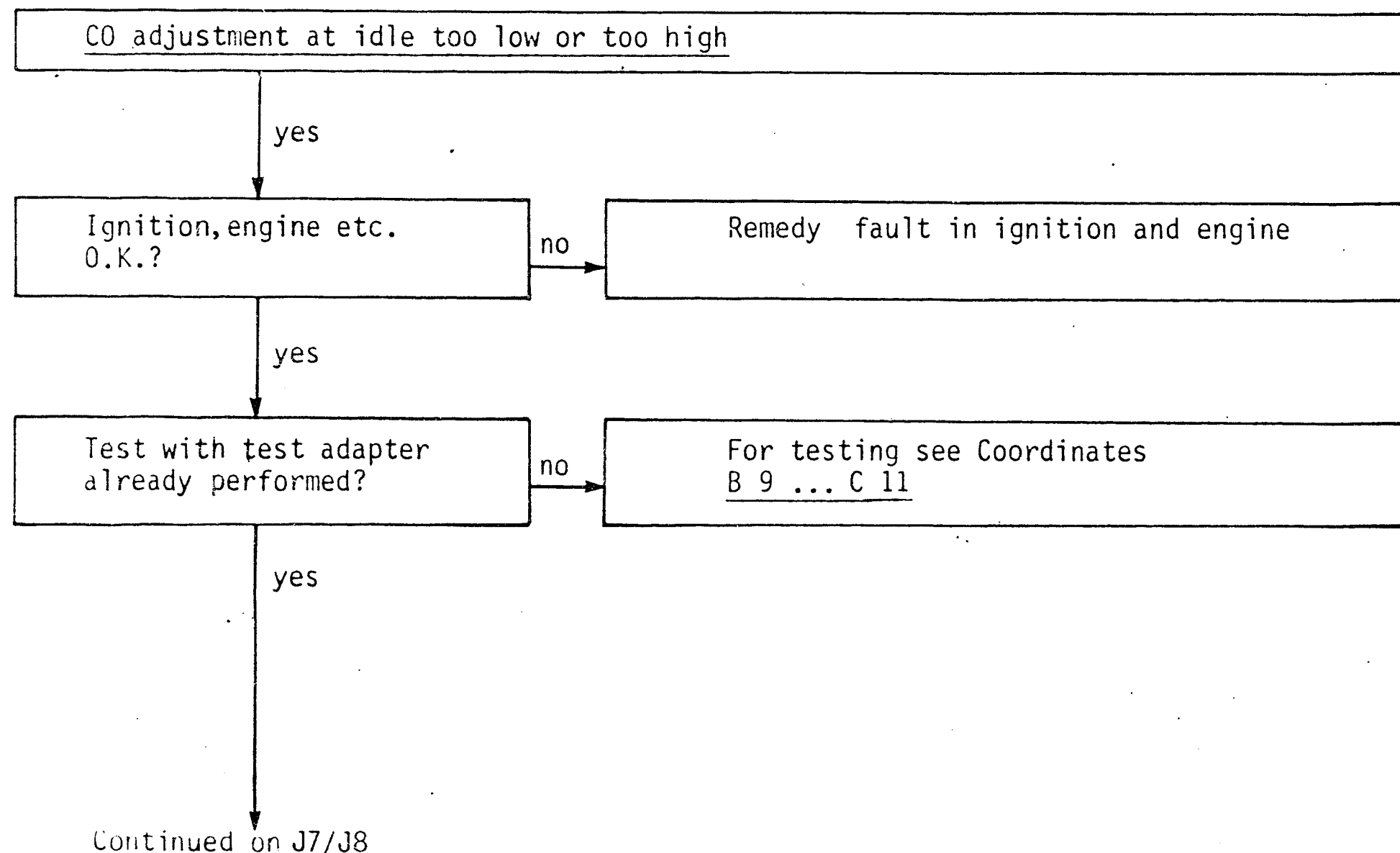
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



J5

CO adjustement
BMW 5, 6 and 7 series



J6

CO adjustement
BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

CO and engine speed correctly adjusted?

no

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed

Manually-shifted transmission: $800 \dots 900 \text{ min}^{-1}$

Automatic transmission
(Selector lever in position "P"):

$800 \dots 900 \text{ min}^{-1}$

CO setting:

$\text{max. } 1.5\% \text{ by vol. CO}$

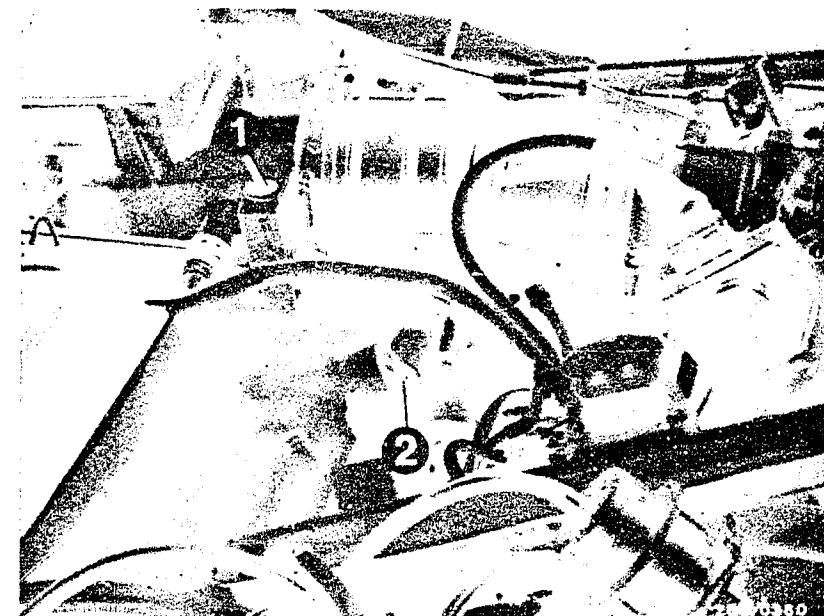
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check the engine speed and the CO concentration again. Carry out adjustments in several steps. After adjusting, use new red plugs (1 280 508 012).

yes

CO not adjustable?

yes

Continued on J9/J10



1 = CO adjusting screw

2 = Idle-speed-adjusting screw

J7

CO adjustment

BMW 5, 6 and 7 series



J8

CO adjustment

BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

Air-flow sensor OK?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: $160...300\ \Omega$. Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: $60...1000\ \Omega$. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes

Fuel pressure OK?
Test specification: $2.8...3.2$ bar
Test specification reached?

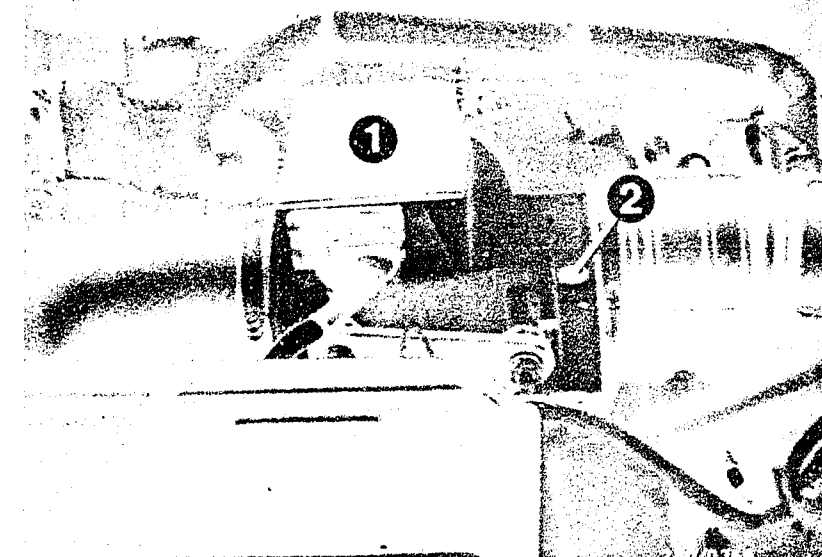
no

Testing the fuel pressure
Remove hose from the fuel delivery line (connection on fuel-distribution pipe). Connect pressure gauge.

Caution: When tightening the fuel hose make sure that no fuel gets onto hot parts of the engine.

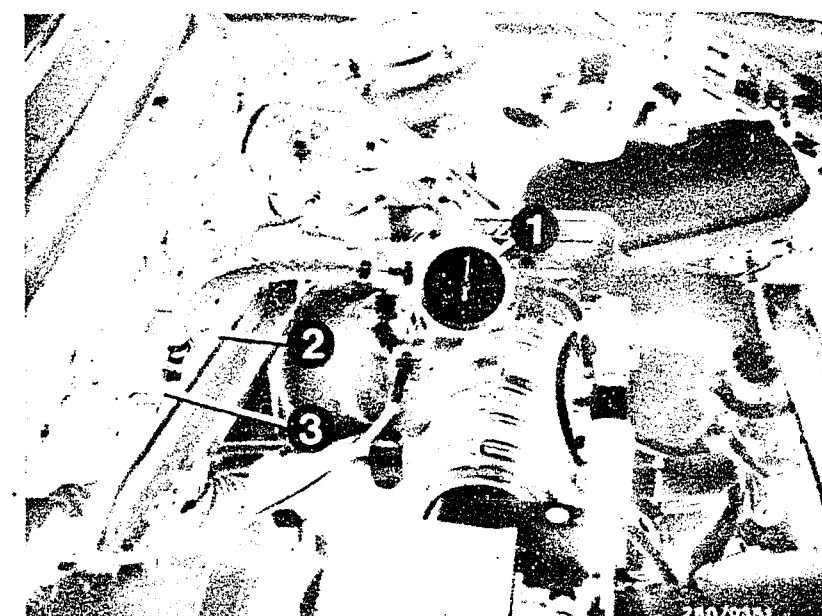
yes

Continued on J11/J12



1 = Air-flow sensor
2 = CO adjusting screw

1 = Pressure gauge (pressure tester 1 687 231 154)
2 = Fuel delivery line
3 = To fuel-distribution pipe



J9

CO adjustment
BMW 5, 6 and 7 series



J10

CO adjustment
BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

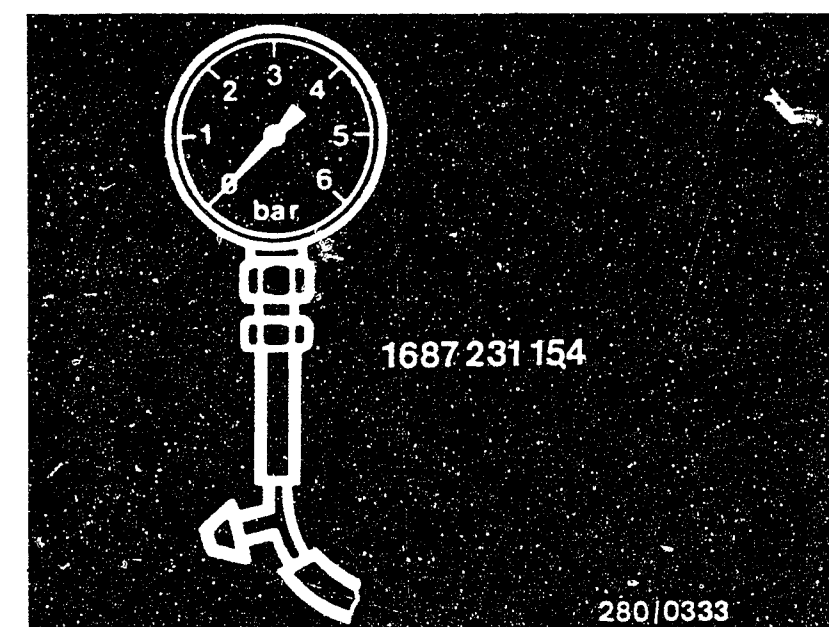
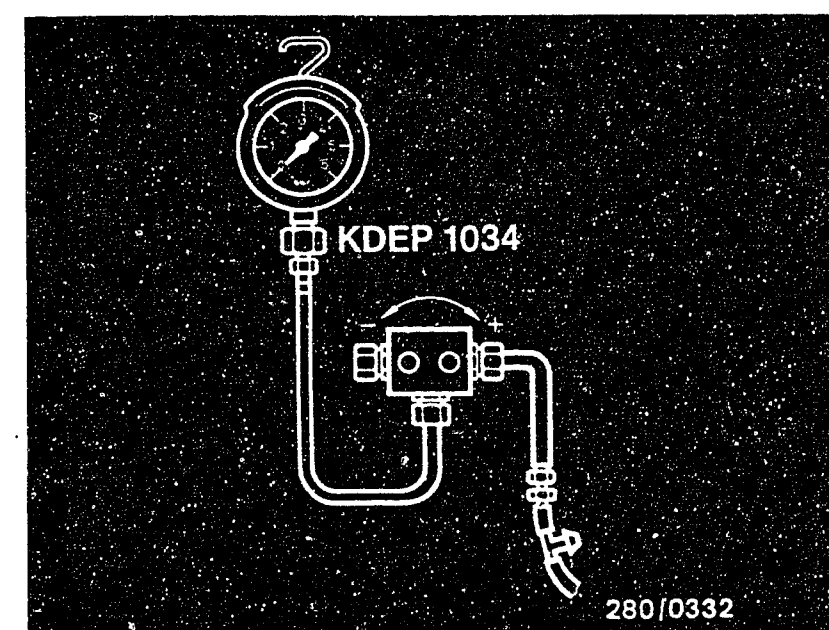
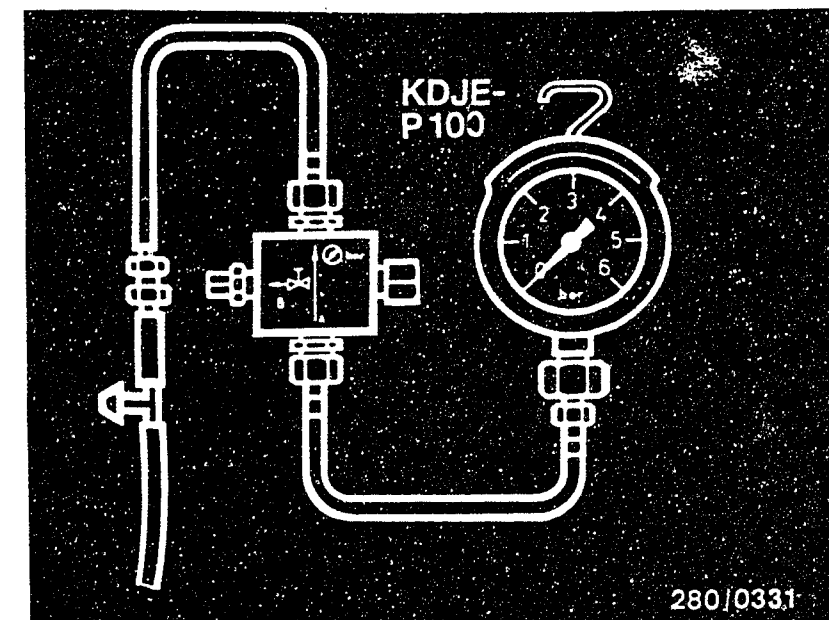
Fuel pressure OK?
Test specification: 2.8...3.2
bar
Test specification reached?

no

Connect the connections of the pressure testers into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic. The end of the hose is plugged onto the fuel-distribution pipe, and the free Y-piece is plugged onto the fuel delivery hose to the fuel-distribution pipe. Make sure there are no leaks.

yes

Continued on J13/J14



J11

CO adjustment
BMW 5, 6 and 7 series



J12

CO adjustment
BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

Fuel pressure OK?
Test specification: 2.8...3.2 bar
Pressure regulator OK? Test specification reached?

no.

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30. Fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Caution!

Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2,5 bar.

Testing the pressure regulator

Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30. Electric fuel pump must operate.

Fuel pump pressure: 2.8...3.2 bar

Fuel pressure of 2.8 bar not reached:

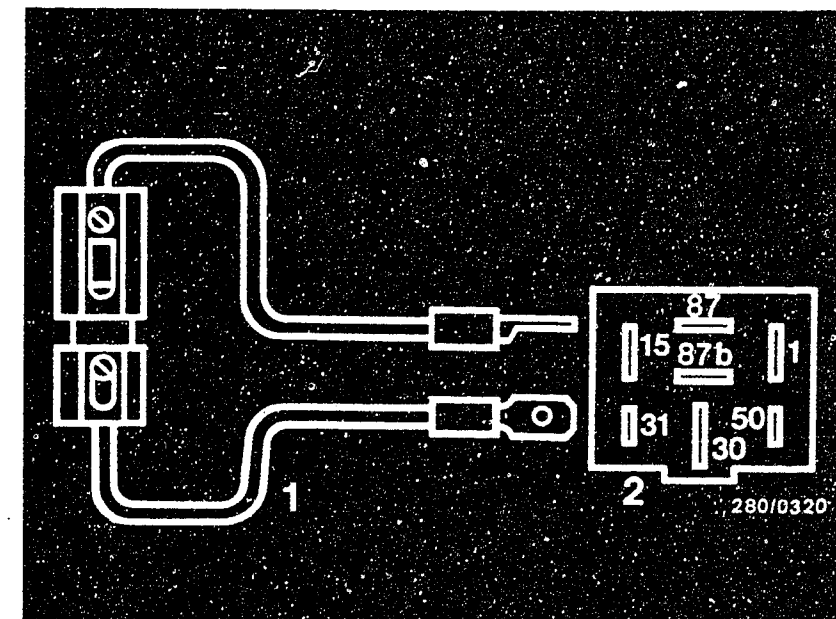
1. Slowly pinch off fuel return line: (Caution: do not load pressure gauge above 6 bar.)

Pressure rises above 4 bar → replace pressure regulator.

Pressure remains below 4 bar → replace fuel pump.

yes

Continued on J15/J16



Jumper (user-fabricated)

1 = Fuse holder with a 10 A fuse

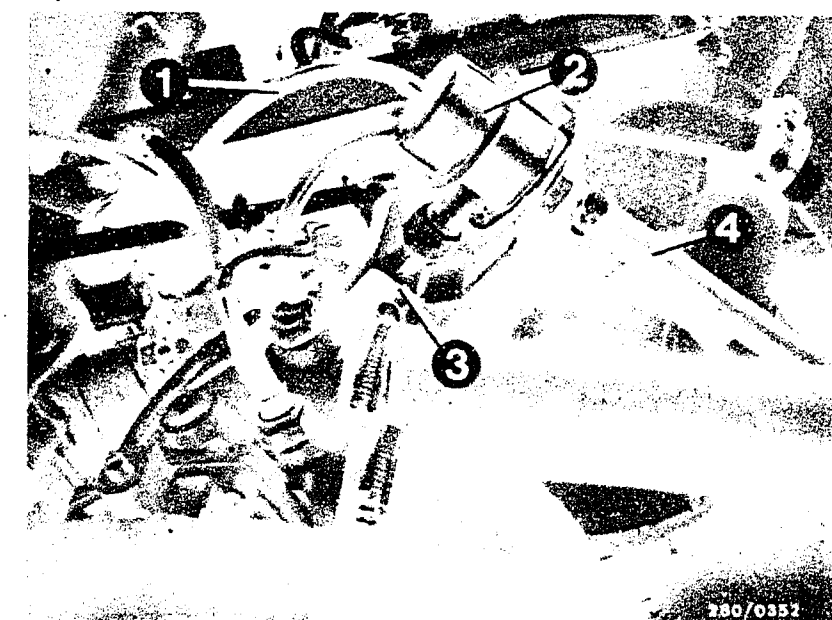
2 = Top view of connection base

1 = Pressure regulator

2 = Fuel delivery line

3 = Fuel return line

4 = Intake-manifold connection



J13

CO adjustment

BMW 5, 6 and 7 series



J14

CO adjustment

BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

Fuel pressure OK?
Test specification: 2.8...3.2
bar
Pressure regulator OK?
Test specification reached?

no

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 3.2 bar exceeded:

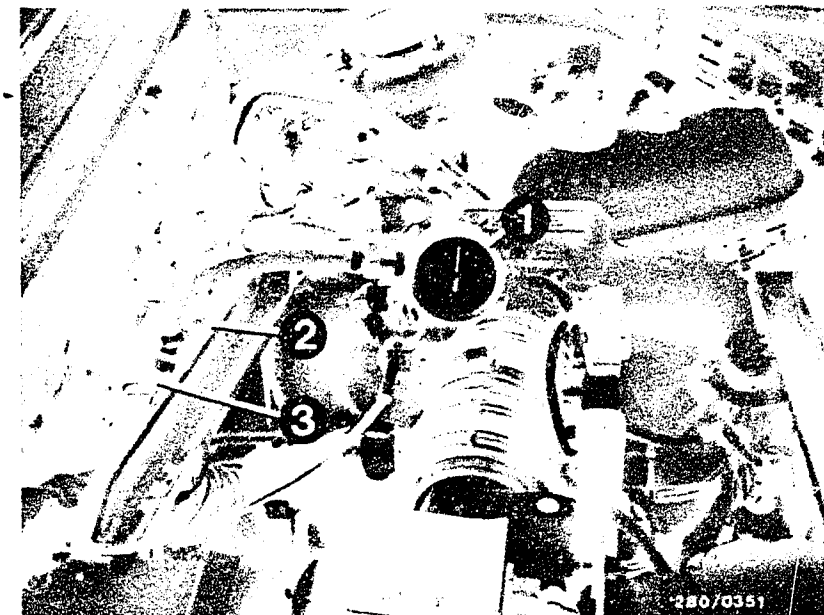
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!

Jumper must be removed again after test is completed, and the control relay must be fitted in position.

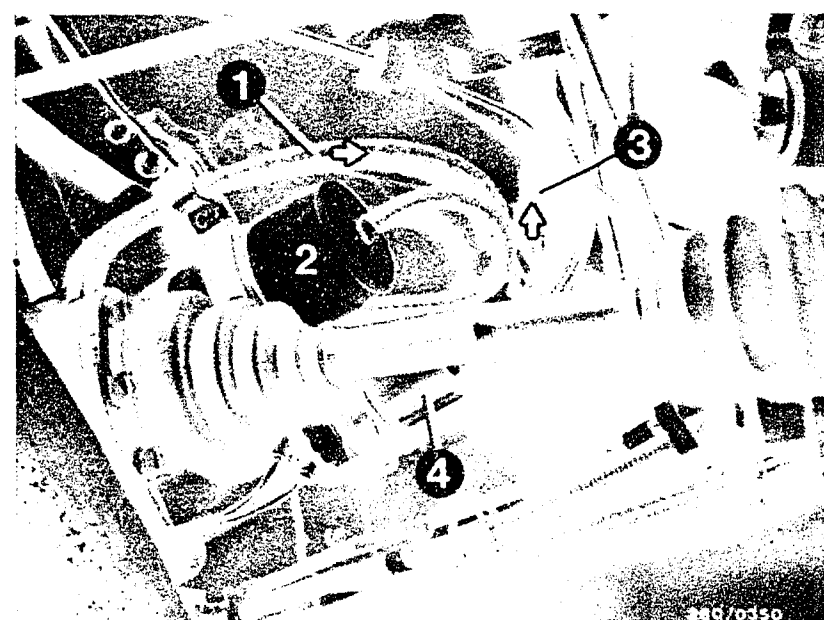
yes

Continued on J17/J18



- 1 = Pressure gauge (pressure tester 1 687 231 154)
2 = Fuel delivery line
3 = To fuel-distribution pipe

- 1 = Fuel delivery line
2 = Fuel filter
3 = Fuel return line
4 = Electric fuel pump



J15

CO adjustment

BMW 5, 6 and 7 series



J16

CO adjustment

BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

CO concentration below tolerance?

max. 1.0 % by vol. CO

Temperature sensors OK?

no

Testing:

Temperature sensor I measures the intake air temperature and is located in the air duct of the air-flow sensor. Measure the following resistance value between term. 8 and term. 9 of the air-flow sensor: 160...300 Ω

Temperature sensor II measures the engine temperature.

Make direct resistance measurement at temperature sensor II (engine) using ohmmeter.

Resistance measurement at term. 10 and term. 38 (ground):

At ambient temperature (+15°C..30°C): 1.3..3.6k Ω

At operating temperature (+80°C): 250..390 Ω

If incorrect, check for open circuit or short circuit in the following leads using ohmmeter.

Temperature sensor I:

Multiple plug term. 8 to air-flow sensor term. 8 and air-flow sensor term. 9 to multiple plug term. 9.

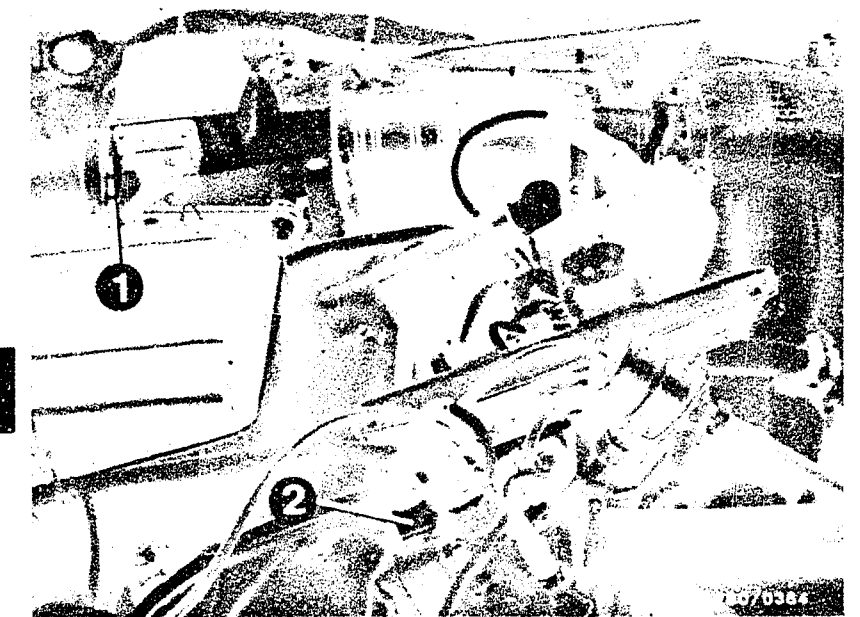
Temperature sensor II:

Multiple plug term. 10 to temperature sensor II term. 10 and temperature sensor II term. 38 to electronics ground terminal (lead 38).

Check all contacts in the plug-in sections.

yes

Continued on J19/J20



- 1 = Temperature sensor I
(in the air inlet side of the air-flow sensor)
- 2 = Temperature sensor II
(in the engine cooling system)

J17

CO adjustment

BMW 5, 6 and 7 series



J18

CO adjustment

BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

CO concentration below tolerance?

max. 1.0 % by vol.

Start valve O.K.?

no

Testing the start valve for leaks:

1. When installed

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed

Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).

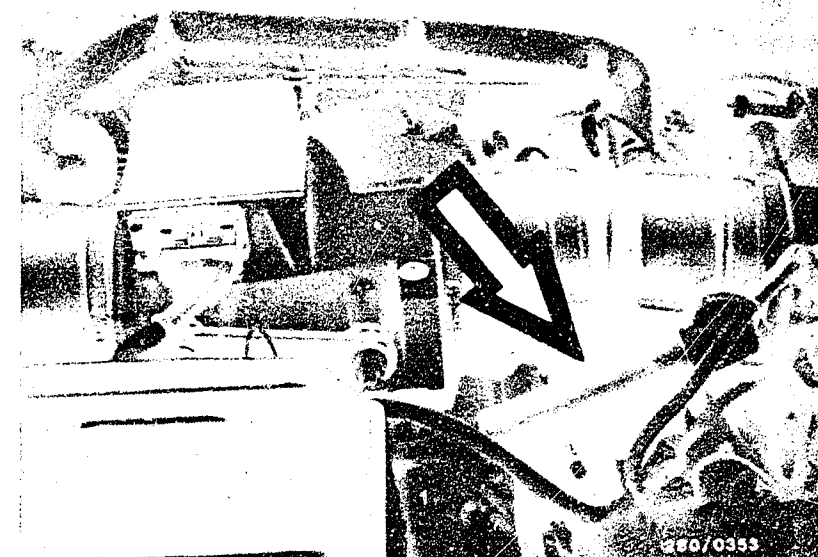
Caution!

The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

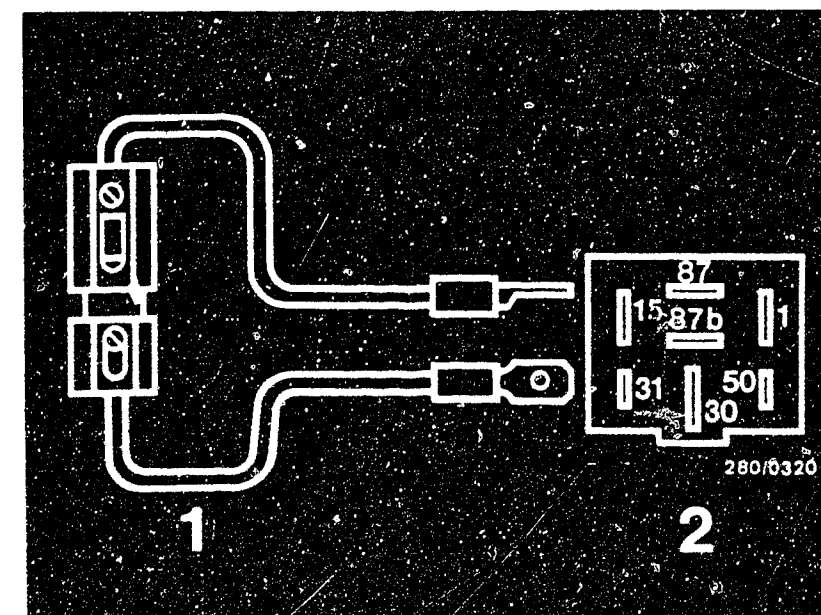
yes

Continued on J21/J22



Arrow = Start valve
(blue plug)

Jumper (user-fabricated)
1 = Fuse holder with a 10 A fuse
2 = Top view of connection base



J19

CO adjustment

BMW 5, 6 and 7 series



J20

CO adjustment

BMW 5, 6 and 7 series



CO adjustment at idle too low or too high (continued)

CO concentration above

0.2 % by vol.?

Air-intake system leak tight?

no

Checking for leaks:

Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Remove hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

yes

Testing completed for customer complaint

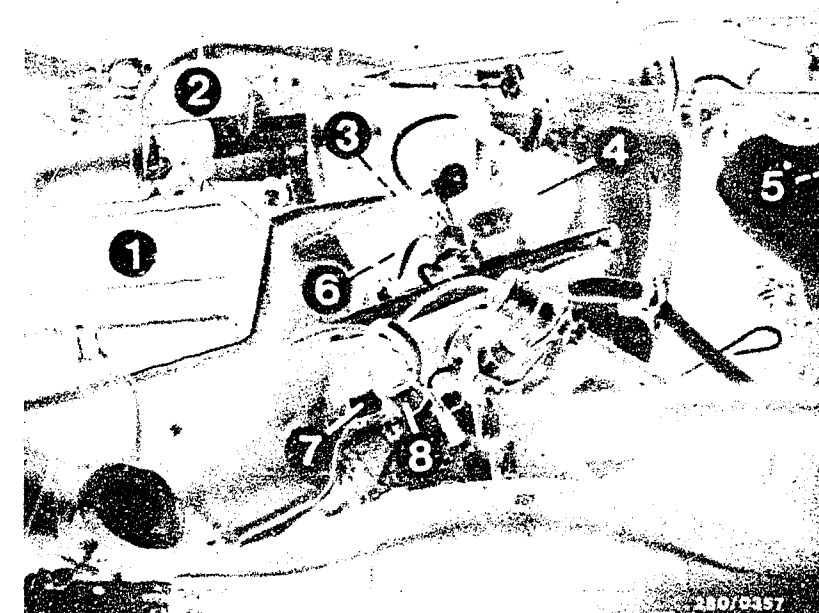
"CO adjustment".

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8)
If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K.
(compression, valve setting, valve timing, worn camshaft).



- 1 = Air filter
- 2 = Air-flow sensor
- 3 = Start valve
- 4 = Throttle-valve switch
- 5 = Control relay
- 6 = Auxiliary-air device
- 7 = Temperature sensor II (white plug)
- 8 = Thermo-time switch



After-sales Service

Technical Bulletin

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New Product

L-JETRONIC, 2nd. GENERATION

28

VDT-I-280/5 En

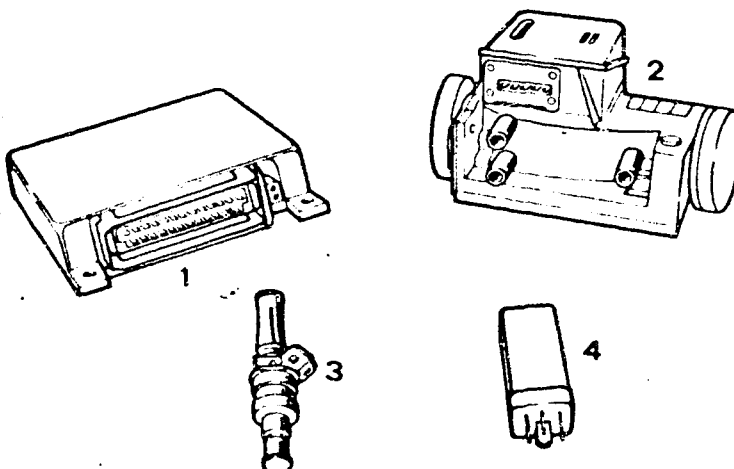
8.1981

General

The familiar L-jetronic system has now been extended by the introduction of the 2nd. generation L-Jetronic. There are now 2 L-Jetronic systems on the market. This 2nd. generation system has been further developed in a number of the most important major components with the aim of reducing costs. As regards functioning, the 2nd. generation L-jetronic differs insignificantly from its predecessor.

The following components and functions have been modified:

- Control unit
- Air-flow sensor
- Control relay
- Solenoid-operated fuel-injection valve
- Overrun cut-off (reduction in fuel consumption)



- 1 = 2nd. generation control unit
- 2 = Air-flow sensor
- 3 = Solenoid-operated fuel-injection valve
- 4 = Control relay

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L1

Technical Bulletins

BMW 5, 6 and 7 series



Control unit

The circuitry of the control unit has been simplified. The electronic functions, though, remain unchanged.

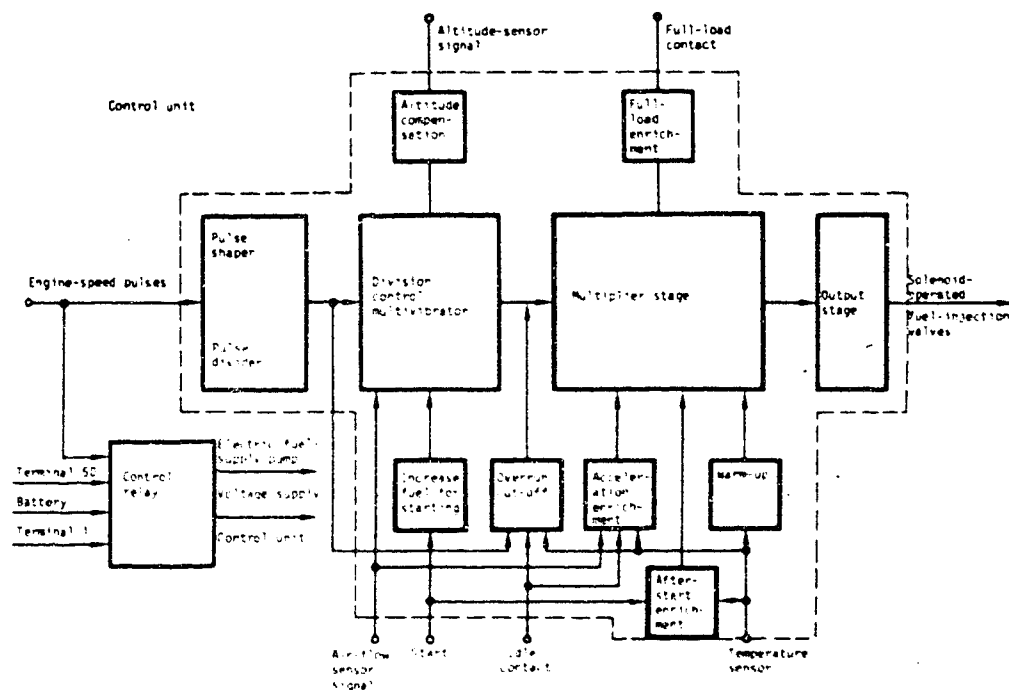
Due to the simplification measures, the circuitry is considerably more compact and this means that the casing can be slightly reduced in size and is lighter. The connection plug was also reduced to a 25-pin version.

Depending upon customer requirements, auxiliary and/or corrective functions can be incorporated in the control unit in order to adapt fully to the particular characteristics of the engine concerned.

Available functions:

- Basic control
- Overrun cut-off
- Increased fuel for starting
- Altitude compensation (input circuitry)
- After-start fuel enrichment
- Acceleration enrichment
- Full-load enrichment
- Warm-up

2nd generation L-Jetronic (block diagram)



Air-flow sensor:

The air-flow sensor has retained its shape and was only modified in the potentiometer chamber.

The pump contact has been omitted, and the air-temperature sensor (NTC 1) is now integrated within the circuitry of the air-flow sensor.

Due to these modifications, the number of terminal points was reduced from 7 to 5 (one of these terminals is the measurement point M, or E, and is reserved exclusively for alignment and calibration at the works).

Control relay:

Due to the fact that the pump contact has now been omitted from the air-flow sensor, the fuel-flooding safeguard function had to be transferred to another component. A control relay (rotational-speed relay) takes over this, as well as a number of other functions. During starting, voltage is supplied to the solenoid-operated injection valves and the electric fuel-supply pump through terminal 50 of the control unit.

When the engine has started, voltage continues to be applied only if the engine speed remains above 225 min^{-1} for 4-cylinder engines and 150 min^{-1} for 6-cylinder engines.

The relay set has been replaced by this control relay.

Solenoid-operated injection valves (yellow plug):

The control unit has a switched final stage. For this reason, the solenoid-operated injection valves are fitted with a brass solenoid winding.

Due to the former series resistors now being omitted, resistance had to be transferred to the injection valves themselves. This led to the development of a brass solenoid winding in place of the one made of copper (brass has a higher specific resistance than copper).



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CAR ALARM II - 0 335 411 901

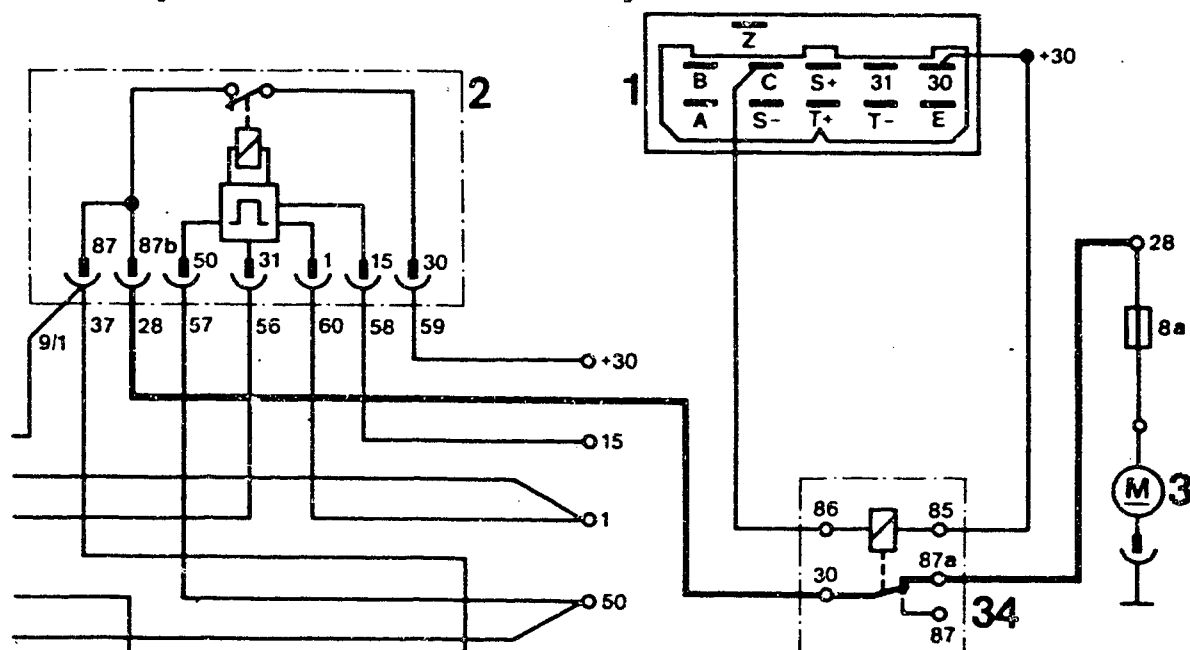
VDT-I-335/111 En

in vehicles with L-Jetronic of the 2nd. generation

11.1981

If Car Alarm II (0 335 411 901) is fitted at a later stage in vehicles in which the engines are equipped with L-Jetronic of the 2nd. generation, then we recommend using the following wiring circuit as protection against theft. In this way the fuel pump is switched off when the alarm system is "primed." No fuel is therefore supplied.

Circuit diagram for L-Jetronic of the 2nd. generation



1 = Alarm relay
2 = Control relay L-Jetronic, 2nd.
generation

3 = Electric fuel pump
34 = Additional relay
0 332 204 150 (formerly
0 332 204 125)

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L4

Technical Bulletins

BMW 5, 6 and 7 series



After-sales Service

Motor Vehicle Service Information

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BMW

VDT-I-BMW 039 En

525i, 528i, 628CSi, 725i, 728i

8.1981

L-Jetronic 2nd. generation

Vehicles manufactured as from 9.81

With the above mentioned types of vehicle BMW are introducing the L-Jetronic of the 2nd. generation.

The difference from the existing L-Jetronic systems is not the method of operation of the injection system, but the design of the control unit and of the injection valves.

Control unit (0 280 001 3..)

- new electronic construction
- new plug and socket, 25 pin
- new housing

Injection valves (0 280 150 2..)

- brass-wire coil with higher resistance
- O-ring connection design

Testing possibility L-Jetronic II

From February 1982 a Universal tester will be available to the After-Sales Service Organization. The L-Jetronic II and other new injection systems can be tested with this tester.

Urgent cases for the After-Sales Service

If problems should arise on vehicles with L-Jetronic II during the period prior to the availability of the Universal tester, please contact KH/VKD 2.

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L5

Motor Vehicle Service-Information

BMW 5, 6 and 7 series



After-sales Service

Motor Vehicle Service Information

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UNIVERSAL TEST ADAPTER

VDT-I-Gen. 1001 En

1.1982

1. Application

The multiplicity of different fuel-injection and ignition systems at present available on the market, as well as the advances in development which can be expected in the future, demand a new testing concept. In order to maintain the outlay for test equipment, and hence the costs, at a reasonable limit we have developed the universal test adapter.

The following systems can be tested using a test-adapter universal unit together with adapter leads suited to the system in question:

1.1 Systems which are already being fitted as series:

- L-Jetronic (1st generation)
- LE-Jetronic (2nd-generation L-Jetronic)
- Motronic (with the new connector designation, refer to the vehicle-specific instructions!)

1.2 Systems whose introduction is planned:

- Motronic with gearbox control
- KE-Jetronic
- Mono-Jetronic
- Electronic ignition system with ignition map (EZF)

2. Delivery dates and Part Numbers

Available as from 2.1982.

2.1 Universal test adapter (basic unit)

Part Number: 0 684 101 801

Designation: ETT 018.01

2.2 System adapter lead for LE-Jetronic (2nd-generation L-Jetronic)

Part Number 1 684 463 123

First application: For BMW 2.5/2.8 l engines as from 9.1981, and for Opel 2.0 l engines (Manta/Rekord) as from 9.1981.

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Motor Vehicle Service-Information

BMW 5, 6 and 7 series



2.3 System adapter lead for Motronic with new connector assignment.

(Refer to the vehicle-related instructions!)

Part Number : 1 684 463 124

First application: Porsche 944 as from series production, BMW as from about 3.1982 (Europe)

2.4 System adapter lead for L-Jetronic (in preparation)

Further system adapter leads will be made available along with the introduction of the new systems as mentioned above.

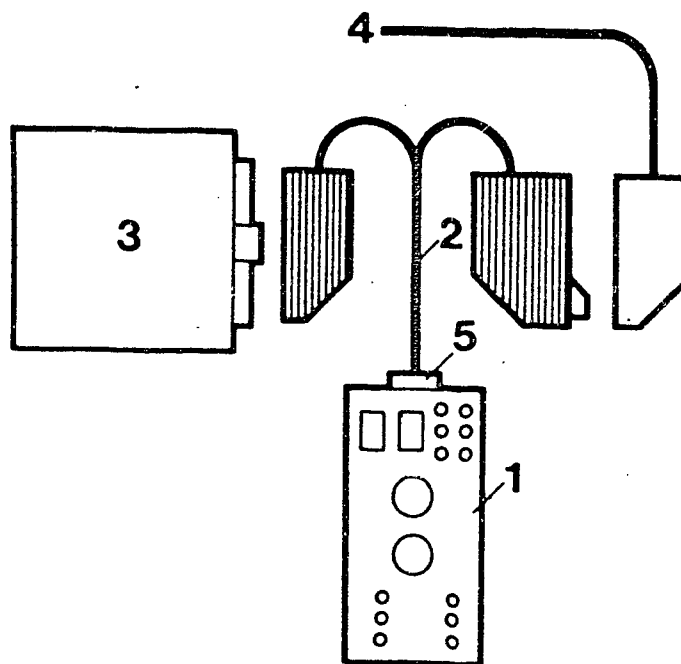
3. Testing procedure

The systems and the components are tested for voltage and resistance values as well as for correct functioning. Evaluation is by means of a multimeter and the Motortester which are connected into the universal test adapter.

Depending upon the complexity of the system, interchangeable adapter lead model 1 or model 2 is provided:

3.1 Adapter lead for peripheral and function testing (Model 1)

The universal test adapter together with the system adapter lead is to be connected to the system wiring harness and to the control unit (e.g. Motronic).
To be tested: Wiring harness with components and control unit.



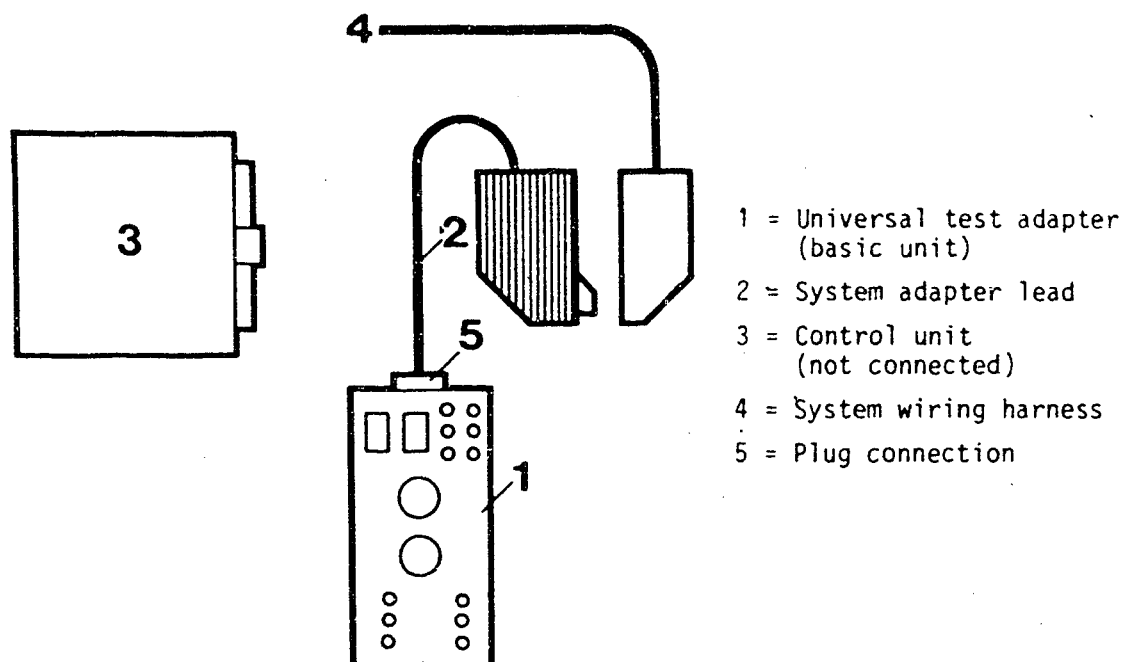
- 1 = Universal test adapter (basic unit)
- 2 = System adapter lead (Y-version)
- 3 = Control unit
- 4 = System wiring harness
- 5 = Plug connection



3.2 Adapter lead for peripheral testing (Model 2)

The universal test adapter with system adapter lead, is only to be connected to the system wiring harness (e.g. LE-Jetronic (2nd-generation L-Jetronic)).

To be tested: Wiring harness with components (without control unit).^a

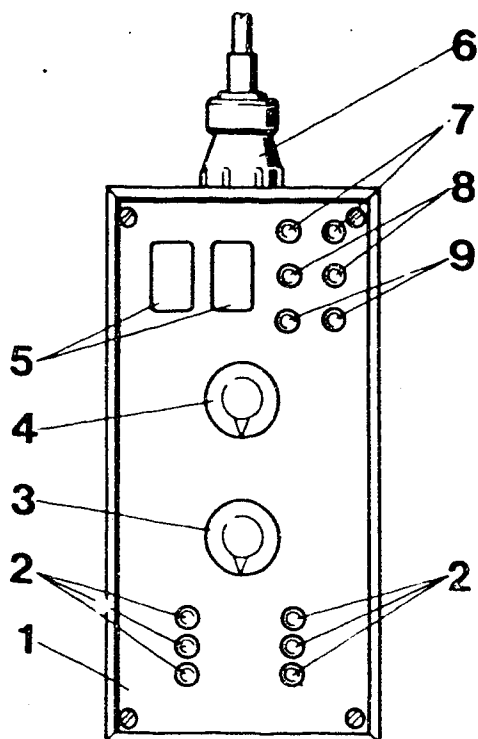


4. Construction of the universal test adapters

The universal test adapter is fitted with 2 program switches footage and resistance measurement. The measured values are displayed on the multimeter connected to the universal test adapter. For reasons of safety, the voltage and resistance sockets are separated. In order to measure signals (e.g. injection pulses, ignition pulses), it is necessary to connect a Motortester to the measuring cavities (special input).

When carrying out functional tests with the control unit connected, selected push-buttons are pressed in a number of test-program steps in order to simulate a variety of different engine operating conditions the influence of which is evaluated using the Motortester.





- 1 = Universal test adapter (basic unit)
- 2 = Keyboard for simulation of various conditions e.g. engine temperature, throttle position etc.
- 3 = Program switch "Ohm" for resistance measurement
- 4 = Program switch "Volt" for voltage measurement
- 5 = Measurement "cavities" (for the special input from the Motortester)
- 6 = 63-pole plug-in connection for connecting the system adapter lead
- 7 = Measurement sockets (voltage measurement with a multimeter or with the Motortester)
- 8 = Measurement sockets (resistance measurement with the multimeter)
- 9 = Sockets for special functions (not yet allocated)

Notes:

1. The Motronic test adapter (0 684 101 800, ETT 018.00) will continue to be used for Motronic-equipped BMW vehicles (with old connector assignment) up to about year of manufacture 3.1982 (refer to vehicle-specific instructions).
2. Details on the operation of the universal test adapter, and the test specs, are to be found in the vehicle-specific after-sales service instructions.

3. Caution! Change of Part Number:

On the SIS-microfiches OPE-00/J22 (Coordinates A14 and A17) the new Part Numbers are as follows:

Universal test adapter: 0 684 101 801

Adapter lead : 1 684 463 123



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Voltage supply (control relay).....	G 3 - G 4
Voltage peaks.....	G 5 - G 6
Air-flow sensor.....	G 7 - G 8
Fuel delivery.....	G 9 - G10
Control unit.....	G11 - G12
Burbling.....	G11 - G14
Solenoid-operated injection valve.....	G15 - G16

Customer complaint: fuel consumption too high.....

<u>high</u>	G17 - H12
Fuel pressure.....	G19 - H 2
Pressure regulator.....	G23 - G24
Solenoid-operated injection valve.....	H 3 - H 4
Start valve.....	H 3 - H 4
Temperature sensors.....	H 5 - H 6
Air-flow sensor.....	H 7 - H 8
CO and idle adjustment.....	H 9 - H10

Customer complaint: no maximum engine power, top speed not reached.....

<u>not reached</u>	H13 - J 4
Throttle-valve adjustment.....	H15 - H16
Fuel pressure.....	H15 - H24
Pressure regulator.....	H19 - H20
Fuel delivery.....	H23 - H24
Air-flow sensor.....	J 1 - J 2
Hose lines, electric lead connections and leak test.....	J 3 - J 4



Customer complaint: CO adjustment at
idle too low or
too high

J 5 - J 22

CO and idle adjustment J 7 - J 8

Air-flow sensor J 9 - J 10

Fuel pressure J 9 - J 16

Pressure regulator J13 - J 14

Temperature sensors J17 - J 18

Start valve J19 - J 20

Leak test J21 - J 22

Technical Bulletins

and Motor Vehicle Service Information .. L 1 - L 9

